SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1890, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIII.—No. 19. ESTABLISHED 1845. NEW YORK, NOVEMBER 8, 1890. $3.00 A YEAR. WEEKLY.

THE FLOATING DERRICK RELIANCE.

The Chapman Derrick and Wrecking Company, of this city, has recently performed successfully two operations that have brought it prominently before the public. Some days ago as the City of New York, the celebrated Inman steamship, was coming up the Hudson River, at the conclusion of a voyage, one of her twin propellers struck the tug boat Viking and cutting a hole in its side sent it instantly to the bottom. The Chapman Company at once sent their derrick Reliance to the spot, and by the aid of a diver passed chains around the hull of the sunken vessel. Attaching the great falls of the derrick to the chain slings thus formed, the tug boat was slowly raised to the surface and taken away for repairs. But a few days later another tug boat, the James A. Garfield, was sunk off the Battery in a collision with another steamer. This tug boat was also raised in a few days by the Reliance. A curious feature in this case was that although the tug boat was instantly sunk, her hull was intact. The collision must have careened her so that she filled with water over her rail.

To the same company was intrusted the work of discharging the elephant Jumbo, the derrick hoisting him out with his cage from the steamer in which he had crossed the ocean. The placing upon a canal boat of the fifty-ton granite block forming the base of the memorial to John Wentworth, of Chicago, was also one of the recent achievements of the Reliance. After this was in place in the boat, and after the latter had started, it proved unable to pass some places in the canal. The boat therefore returned and the great block was tilted over and secured diagonally, and was then successfully shipped.

The derrick in question is built under and is protected by the patent granted to Mr. W. E. Chapman.

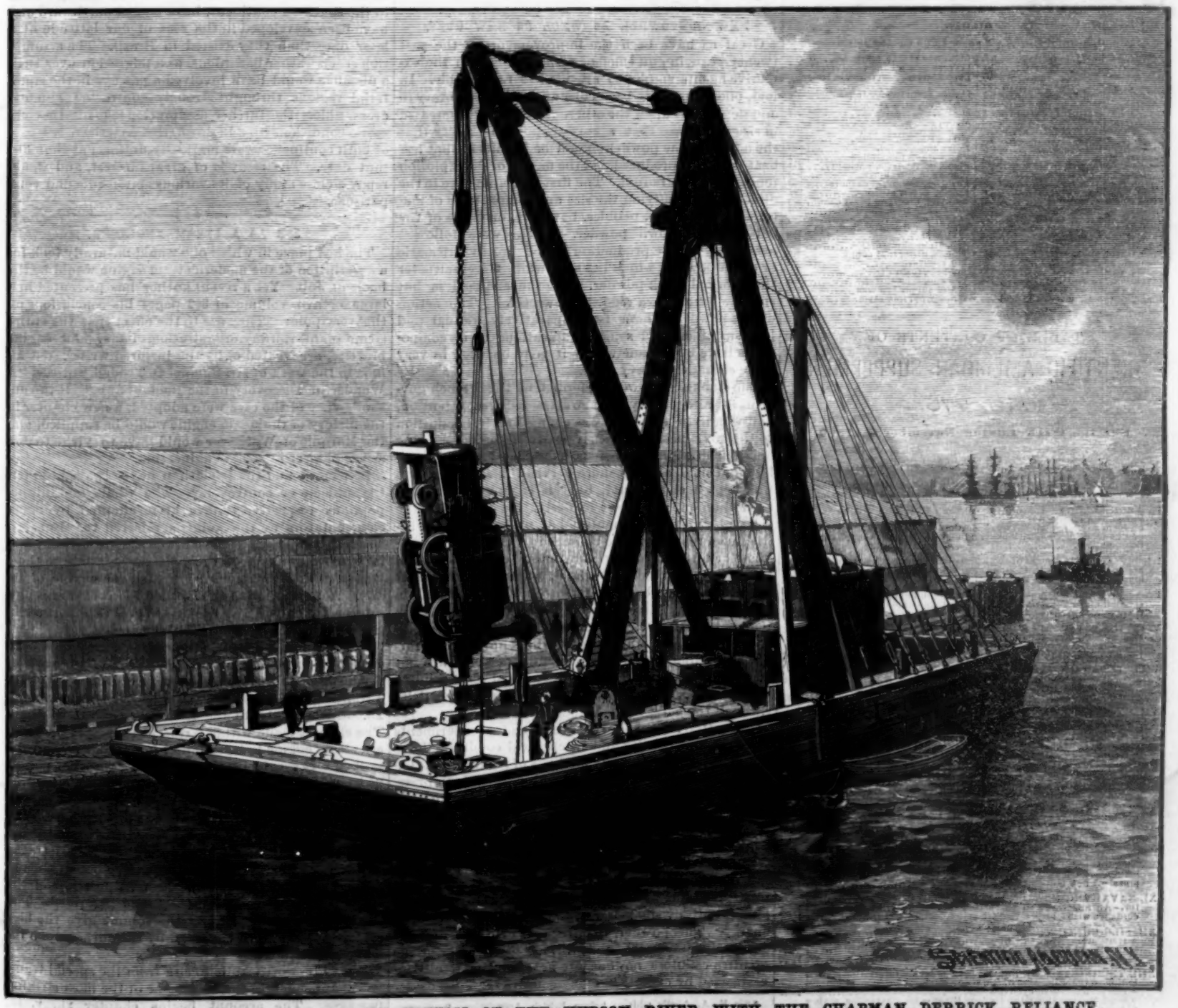
From the deck of a scow, arranged with water-tight compartments and pump connections thereto for applying water ballast, rises a frame resembling a capital letter A. A diagonal boom is swiveled to the deck beneath this frame and is worked by tackle attached to its top and carried back to the frame. The boom and two frame pieces are built up of staves and are hooped at regular intervals. A number of guys or shrouds with turn buckles are attached to and extend backward from the head of the frame to chain plates on the sides. On her deck is the necessary steam plant for working the windlasses and pumping out the compartments. While nominally of 135 tons lifting capacity, it is hard to put a limit to its power.

In the cut we illustrate the raising of a sunken locomotive. This engine ran into the river from a dock on the Hudson River at the foot of West Twenty-second Street, in this city, and was raised bodily by the Reliance, without any injury to its machinery. A diver was sent down who placed a heavy toggle across the opening of the fire door and within the fire box. The chain was attached to this, and the engine raised as shown. The locomotive was a drilling engine belonging to the Erie Railroad. No one was in the cab at the time it ran into the river. Some person standing on the ground threw a wrench or other article into the cab. This probably struck the valve handle or reversing lever, and moved it enough to start the engine, which ran down the track and plunged into the water.

Interesting Lecture on Caves.

On the evening of October 22, Dr. Horace C. Hovey, of Bridgeport, Conn., delivered a very interesting lecture on the great caves of Indiana and Kentucky, before the Brooklyn Institute. The lecture was profusely illustrated by lantern views, which, considering the difficulties attending this sort of photography, were remarkably fine. The variety of forms of stalactites and stalagmites, the alabaster flowers, the clustered columns, together with the narrow passages and capacious chambers, the shining white of the alabaster and the inky blackness of the small and large openings, were blended in a series of weird and rare pictures not soon forgotten.

Dr. Hovey is well known to our readers as a writer on caves, his writings upon the subject having frequently appeared in the SCIENTIFIC AMERICAN and SUPPLEMENT.



RAISING A LOCOMOTIVE FROM THE BOTTOM OF THE HUDSON RIVER WITH THE CHAPMAN DERRICK RELIANCE.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico..... .....$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, nine dollars a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

NEW YORK, SATURDAY, NOVEMBER 8, 1890.

Contents.

(Illustrated articles are marked with an asterisk.)

Antiperistics, new, bad effects.... 286
Apoplexy, antimony for..... 284
Bell crawls 285
Belting, something new..... 289
Burton, Richard Francis..... 284
Caves, lecture on 287
Celluloid as drawing material..... 282
Coins, queer kinds of 282
Cycle, water, improved*..... 284
Decisions, patent..... 287
Derrick, floating, Reliance*..... 287
Diamond, the 287
Diffuser, flash light, Bridges*..... 284
Dumbwaiter, Larsen's*..... 287
Engines of yacht Lady Torrida* 280
Fluid, bleaching, new 281
Frog, railroad, Baird's*..... 284
Gate, farm, Oesterling's*..... 284
Gauge, finger ring, novel*..... 285
Gunpowder, new, and new guns. 278
Headache and the eyes 282
Heads, bald, hope for..... 282
Hub, wheel, Hall's*..... 284
Incomes, growth of..... 286
Indicator, gas value..... 283
Inventions, recently patented... 288
Job as a steam engineer..... 278
Light, incandes., decreasing cost 286
Lightning stroke, two cases..... 286
Locomotive, raising from river*. 287
Locomotives, American, in Holy Land..... 287
Machine, soldering, Jensen's*... 287
Mastodon, great, remains of. ... 285
Matter, coloring, green, new..... 281
Metal, sheet, shaping, Dewey's improvements in*..... 285
Mines, tin, San Jacinto..... 283
Notes and queries..... 289
Phonograph forestalled..... 287
Plane, carpenter's, antiquity.... 286
Planets in November..... 280
Powders, baking, once more..... 286
Power, water, utilizing*..... 281
Railroad, Colorado River canon. 280
Roads, elevated, electric..... 284
Silver, volcanic..... 286
Studies, palæontological, in Brazil..... 288
Sun, atmosphere of..... 285
Things, little, that count..... 286
Tin, recovering..... 281
Tunnels, town of... 280
Volcano, Bogoslov..... 284
Water supply systems..... 285
Wheels, fly, new style..... 284

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 775.

For the Week Ending November 8, 1890.

Price 10 cents. For sale by all newsdealers

PAGE

I. AERONAUTICS.—Military Ballooning in France.—Recent military maneuvers with balloons as conducted in France.—2 illustrations. 12356

II. ARCHÆOLOGY.—Restoration of the Pompeian "House of Fauns."—A most interesting reproduction of an antique Roman house as executed at Saratoga Springs, N. Y., different features of the reproduction, with plan and views of the interior.—3 illustrations. 12375

III. BIOLOGY.—Instances of the Effects of Musical Sounds on Animals.—By ROBERT E. C. STEARNS.—Cats, cows, pigs, and other animals as affected by musical sound. 12370

IV. BOTANY.—Decurrent-Leaved Mutisia.—A beautiful plant from the Chilian Andes, introduced into British gardening.—1 illustration. 12379

V. CIVIL ENGINEERING.—Ferroid, a New Artificial Stone.—By HERMAN FOOLE.—A new type of artificial stone, entirely distinct from the class of concretes hitherto used, its very many applications, a most interesting product. 12367

VI. ELECTRICITY.—The Electrostatic Balance.—A new apparatus of Sir William Thomson's invention.—1 illustration. 12380
M. Ferdinand Carre.—Note on the manufacture of electric light carbons. 12380

VII. FISH CULTURE.—Movable Fish Chute.—A fish chute adapted for varying levels of water.—1 illustration. 12366

VIII. HYGIENE.—The Food of Man in Relation to Health and Longevity, in the Light of Comparative Dietetics.—By FRANK WOODBURY, M.D.—The food problem of to-day, and efforts made for its solution. 12366

IX. MATHEMATICS.—A Device for Rapid Addition and Extraction of the Cube Root.—By Prof. CLARENCE M. BOUTELLE.—A contribution to rapid calculations. 12379

X. MECHANICAL ENGINEERING.—Different Shapes of Saw Teeth and the Way they Cut.—An interesting contribution to the art of dressing saw teeth, with numerous examples.—9 illustrations 12363
Revolving Cylinder Engines.—A peculiar type of engine described in its different modifications, with sectional diagrams.—4 illustrations. 12365
Spirally Welded Steel Tubes.—By JAMES C. BAYLES.—The helical welding and its application to the manufacture of steel pipes.—A new industry graphically described. 12365

XI. NAVAL ENGINEERING.—Lacey's Sea Anchor and Oil Distributor.—An apparatus to be carried on life-boats of vessels, in accordance with a recent English enactment.—2 illustrations. 12367

XII. SILK CULTURE.—The Management of Silk Worms in China.—A translation from the Chinese of Teon Tsu-Tang.—By ROBERT KLIENE.—A most interesting document.—The translation of an elaborate Chinese treatise upon the cultivation of the silk worm. 12360

XIII. TECHNOLOGY.—A New Residual.—A very interesting contribution to the utilization of the waste products from gas processes.—The production of cyanides. 12369
Brick Making along the Hudson River.—An interesting review of the manufacture of bricks as conducted in the district named.—The use of old methods still adhered to. 12364

DECREASING COST OF INCANDESCENT LIGHT.

Incandescent electric lamps are lessening in cost of manufacture while, at the same time, increasing in efficiency, that is to say in length of life. This, too, in the face of a largely advanced price for platinum, of which the wires connecting the outside circuit with the carbon loop within the globe are made. This metal, so important in electrical manufacture, has, indeed, almost trebled in price since the earlier lamps were fashioned, and still has an upward tendency, the supply being inadequate to the demand, and its scarcity forcing the substitution of other and less recommended metals in some departments of electrical manufacture. As to the little incandescent lamps: they must have it, its increased cost not proving so important as was feared, because of the discovery of more economical processes in the making of other parts of the lamp.

Those who have watched the development of the lamp from its earliest stages will recall the laborious work with the mercury pump in creating the vacuum, the amount of hand labor that used to be required to put the parts together, and even when completed how uncertain was its tenure of life. Nature hates a vacuum, or, at least, seems to. With the old processes the most cunning artisan was unable to attain anything like that stage of air exhaustion which now we know is within nature's permissible limits. Some few lamps would glow for nine hundred, perhaps twelve hundred hours before the combustion, always going on, would be sufficient to disintegrate and destroy the carbon loop; others would live for only a small part of that time and die prematurely of too much oxygen. All was uncertain. A manufacturer might set up a score of lamps and have half the number returned to him impotent within a month. Now, with improvements in exhausting apparatus, it costs but a tithe of the old figure to produce a more perfect vacuum; the sealing of the platinum wires is done by machinery, and as a result a far more certain and a longer-lived lamp than that which once cost $1 may be had for considerably less than the half of it, and even then leave a margin of profit for its manufacturer.

NEW GUNPOWDER AS WELL AS NEW GUNS.

Great as have been the improvements of the past twenty years in gun efficiency, the changes in the explosive agents employed are no less remarkable. In fact, one branch has been constantly supplementary to and dependent upon the other. As guns have increased in size there has been a corresponding necessity that the action of the powder should be modified, that less heat might be produced and the nature of the explosion rendered more gradual. The first attempts were in the direction of modifying the size and compactness of material of the grains, pebbles, bowlders, or cubes of the old style of brown powder. These were followed eventually by the production of the brown prismatic or cocoa powder, which has somewhat more saltpeter than normal black powder, while the charcoal is but slightly burned to a reddish brown color. The action of this powder in guns is comparatively gradual and long sustained, and some modifications in its composition have been made where it is to be used in very large charges in heavy guns.

The smokeless powder adopted by the French government about five years ago attracted great attention, and wonderful efficiency was claimed for it, in addition to the obvious advantages it possessed for quick-firing and machine guns on vessels, as well as for field artillery and small arms in shore service. Its composition was kept a close secret, but "it is now known that more than one smokeless explosive has succeeded the original, and that the material at present in use with the Lebel repeating rifle belongs to a class of nitro-cellulose or nitro-cotton preparations,"* of which several have been patented in England, and many varieties of which have been brought forward in Germany and in this country. These nitro compounds do not produce smoke, because their products of explosion are exclusively gases and water vapor, while gunpowder furnishes products of which over fifty per cent are not gaseous, and which are in part deposited as a solid to foul the arm, and in fact distributed in fine particles through the gases of the explosion as smoke.

Gun cotton is smokeless, but thousands of experiments in varying its density and mechanical condition have not yet given us complete methods of regulating its explosive force. Comparatively small charges of compressed gun cotton, arranged in built-up cartridges with the object of regulating the rapidity of explosion, will give high velocities, but the necessary uniformity has not been obtained. Both camphor and liquid solvents, as well as acetic ether and acetone, have been used with gun cotton, and a nitro-cellulose powder containing nitro-glycerine has been brought forward which is almost entirely smokeless, while developing very high energy. This powder, the pressures of which are but gradually developed, and various other descriptions of nitro-cellulose powder, are now being carefully investigated by experts in many countries. The powder adopted in Germany is a description of the nitro compounds which is not entirely smokeless, but the almost transparent film of smoke produced by independent rifle firing with it is hardly more visible than a puff from a cigar. In the British service also an almost absolutely smokeless powder is now used with machine guns and field artillery, the effect of a discharge appearing only as a flash of flame and a slight cloud of dust. The conditions, therefore, under which the next armed conflict between powerful countries must take place are of an altogether different character from those known heretofore; but in such future contest, come when it may, it is safe to say that science and skill, rather than brute force, will have a determining influence to an extent never before known in the annals of war.

* Sir F. A. Abel's address before British Association, SCIENTIFIC AMERICAN SUPPLEMENT, 772.

PALÆONTOLOGICAL STUDIES IN BRAZIL.

Recently an interesting contribution to the palæontology of Brazil, from the pen of Professor John M. Clarke, of the New York Geological Survey, has been published at Rio Janeiro, Brazil. It embraces an examination of the trilobitic remains found in the sandstones of the Ererê and Maecurû districts. The fossils are found in ferruginous sandstones whose elements are quartz, feldspar, and, in the Ererê region, mica. Many of the specimens are inclosed in a crumbling rock which, partially from disintegration, and partially from the presence of sesquioxide of iron, replacing the test of the fossils, are in a perilously frail condition, so that the greatest care is requisite to preserve them.

It has long been known that the fauna of the Ererê region was Devonian, and that it presented striking and deeply interesting similarities to the upper Devonian fauna of New York State. The results reached by Professor Clarke are in the main confirmatory of this important conclusion, except that the Maecurû beds indicate, as far as their crustacean remains go, a pre or early Devonian aspect. He would explain their association with molluscan fossils that are very distinctly Hamilton or upper Devonian in character by an assumption that these molluscan types, originating in the southern continent, have passed northward and have been developed in the seas of our latitude at a later date than they existed in Brazil. The assumption seems rather hazardous, as a migration over such a distance would have involved a passage in the equatorial regions through strongly contrasted climatic areas, unless the further assumption is made that climatic conditions up and down the American seacoast of both continents were markedly uniform at that distant date. The essay is of great interest, and would repay a close study of its various statements and comparisons.

JOB AS A STEAM ENGINEER.

The last place in which one would naturally look for a description of the modern steam engine would be the book of Job. Yet a recent author has presented in a large octavo volume of 362 pages his conclusions on this very point. They are to the effect that the entire steam plant, railway organization, boiler and engine practice, are treated of by the inspired writer. We allude to the work of Mr. Samuel O. Trudell, entitled "A Wonderful Discovery in the Book of Job." If the author's view of the case were adopted, a new chapter in the history of the steam engine would be supplied, and the Marquis of Worcester would have to yield to Job as the pioneer in steam engineering.

Behemoth and the Leviathan have always been fertile subjects of controversy. The whale and hippopotamus respectively have been adopted by many commentators as the animals referred to. But Mr. Trudell goes beyond the most daring innovator, and in a revised version of the passages relating to these monsters finds allusions to the steam engine of to-day. A description of the method followed in his new interpretation will give the best idea of this most striking effort in the field of biblical criticism.

The author, fully to support his theory, has been compelled to furnish a new rendering of the parts of the book of Job which he uses. Accordingly we find a translation given of the passages in chapters xl. and xli. which relate to the Behemoth and Leviathan. The claim is made without reserve that it is the modern steam engine in its different forms that is there described. It is evident that our space does not permit us to give the full bases for the argument. The separate verses are made subjects of as many chapters, and the analogies traced between the descriptions in the poetry of Job and the more prosaic steam motor are really surprising. The most curious details are traced out, such as the supply of water to the boiler, the upright smoke-stack, and even the manipulation of the stock of railroad companies is found described. The size and number of pages in the volume give the best evidence of the work bestowed by the author upon his labor of love.

It may be worth while to cite from the special translation appended to the book some of the most striking passages. The account begins chapter xl., v. 15, "Behold now one with great heat, . . . he will

consume fodder as well as cattle do," which is a pretty fair description of a steam engine. A little further on, v. 17, it says, "His tail will set upright like a cedar." This, the author concludes, refers to the smoke-stack. In v. 18 we find, "His hollow bones are tubes of brass, his solid bones are bars of iron," which is a very good embodiment of modern engineering practice. In v. 21, which the special translation renders, "He will rest beneath light shelters and within a covering of fibrous reeds and clay," the author finds an allusion to non-conducting covering for boilers and steam pipes. Going on to the next chapter, we find v. 6 thus rendered, "Companies will feast upon him, they will share him among speculators," which it is needless to say fits the case of modern railroad companies and speculators exactly. This is one of the extraordinary parallels of the work. It is perhaps equaled by v. 2 of the same chapter, where the hook (ring) in the monster's nose is construed as an allusion to the piston rings of a locomotive, and where the jaw bored through with a thorn supplies an allusion to the piston head bored through with its piston rod. The bad effects of an engineer allowing his water to run down is given in the same chapter, v. 26, "From dryness rendering him furious, he will not have power to withhold; the curved vault being caused to break up and also the armor." This, of course, means that the engineer must watch his water gauges or there will be an explosion.

For a portion of v. 23, chap. xl., and for v. 24 immediately following the author furnishes the following translation: "Behold he will absorb a river and will not fret; . . . . he will gather it up in his fountains by means of traps and with a perforated nozzle." Our author in this finds described the action of a pump with its valves (traps), and the perforated suction pipe with a screen at its end to exclude solid particles. Even the coupling together of a train of cars is found in v. 1 of the next chapter: "Thou wilt extend Leviathan with a hook, or with a snare which thou wilt cause his tongue to press down." The tongue our author believes is the representative of the coupling link, and the hollow drawhead and pin is the "snare." The caulking of the seams of the boiler is found in v. 15 of this chapter: "His strength depends on courses of shields closed up tightly with a seal." Our author finds nothing clearer than that the "shields" are boiler plates, and the "seal" the caulking iron. He reserves, however, the possibility that the steam riveter is the sealing mechanism.

This much is enough to give an idea of the book. The author has been his own Hebraist. The Semitic student and author Rabbi Benjamin Szold, of Baltimore, testifies to his high opinion of Mr. Trudell's translations. It must also be said in conclusion that the subject is treated throughout with full evidence of critical discernment and laborious investigation.

POSITION OF THE PLANETS IN NOVEMBER.

JUPITER

is evening star, and shines brilliantly in the west as soon as it is dark enough for him to be visible. He is in conjunction with Mars on the 13th, at 5 h. 52 m. P. M., being 59′ north. As the event occurs about an hour and a half after sunset, it may be easily observed. Jupiter with a diameter of 36″.0, almost eclipsing his ruddy rival, whose diameter has dwindled down to 8″.0. The five days old crescent moon is in conjunction with Jupiter on the 17th at 6 h. 54 m. P. M., being 3° 25′ south. The moon, Jupiter, and Mars will then form a lovely celestial picture. Much of the planetary interest of the month clusters around this regal star, the most distinguished member of the sun's family, almost a sun himself.

The right ascension of Jupiter on the 1st, at noon, is 20 h. 27 m., his declination is 19° 59′ south, his diameter is 37″.0, and he is in the constellation Capricornus.

Jupiter sets on the 1st at 10 h. 25 m. P. M. On the 30th, he sets at 8 h. 50 m. P. M.

MARS

is evening star. His course, through the month, is closely allied to that of Jupiter. Both planets are moving eastward or in direct motion. Mars moving faster gains upon Jupiter until the 13th, then passes him and recedes from him during the rest of the month, being about 9° east at its close. The moon is in conjunction with Mars on the 17th at 11 h. P. M., being 2° 39′ south. Moon and planet will be below the horizon when the conjunction takes place, but the approach of the two heavenly bodies will be interesting to observe.

The right ascension of Mars on the 1st, at noon, is 19 h. 55 m., his declination is 23° 49′, his diameter is 8″.3, and he is in the constellation Sagittarius.

Mars sets on the 1st at 9 h. 43 m. P. M. On the 30th, he sets at 9 h. 40 m. P. M.

VENUS

is evening star. Her reign as evening star practically closes in November, for she disappears from view during the passage of its closing days, her slender crescent approaching the sun so closely as to be hidden in his rays. She is still very beautiful, shining with a soft, pearly luster, low down in the southwest. The two days old moon is in conjunction with Venus on the 14th at 0 h. 14 m. P. M., being 4° 2′ north. The event takes place in the daylight, but the narrow crescent and the evening star will be fair to see when they appear upon the twilight sky.

The right ascension of Venus on the 1st, at noon, is 17 h. 2 m., her declination is 28° south, her diameter is 43″.8, and she is the constellation Ophiuchus.

Venus sets on the 1st at 6 h. 24 m. P. M. On the 30th, she sets at 4 h. 37 m. P. M.

MERCURY

is morning star until the 16th, and then becomes evening star. He is in superior conjunction with the sun on the 16th at 10 h. 29 m. P. M., when, passing beyond the sun, he reappears on the sun's eastern side, and commences to run his race as evening star. Moving eastward from the sun, he encounters Venus moving westward toward the sun. The conjunction occurs on the 29th at 2 h. 29 m. P. M. and is a very close one, Mercury being 10′ north. The planets are then too near the sun to be visible, and the phenomenon can be seen only in the mind's eye.

The right ascension of Mercury on the 1st, at noon, is 13 h. 59 m., his declination is 10° 44′ south, his diameter is 5″.0 and he is the constellation Virgo.

Mercury rises on the 1st at 5 h. 45 m. A. M. On the 30th, he sets at 4 h. 44 m. P. M.

NEPTUNE

is morning star until the 27th, and then evening star. He is in opposition with the sun on the 27th at 11 h. A. M., and is then nearest to the earth and in fine position for telescopic observation.

The right ascension of Neptune on the 1st, at noon, is 4 h. 18 m., his declination is 19° 42′ north, his diameter is 2″.6, and he is in the constellation Taurus.

Neptune rises on the 1st at 6 h. 16 m. P. M. On the 30th, he sets at 6 h. 42 m. A. M.

SATURN

is morning star. He is a shining light in the sky in the small hours of the morning, and is coming into more convenient position for observation, rising about midnight at the close of the month. The waning moon is in conjunction with Saturn, on the 7th, at 2 h. 17 m. A. M., being 3° 46′ north.

The right ascension of Saturn on the 1st, at noon, is 11 h. 5 m., his declination is 7° 42′ north, his diameter is 15″.8, and he is in the constellation Leo.

Saturn rises on the 1st at 1 h. 48 m. A. M. On the 30th, he rises at 0 h. 5 m. A. M.

URANUS

is morning star, and is too far away to be visible. His right ascension on the 1st, at noon, is 13 h. 44 m., his declination is 10° 12′ south, his diameter is 3″.4, and he is in the constellation Virgo.

Uranus rises on the 1st at 5 h. 30 m. A. M. On the 30th, he rises at 3 h. 44 m. A. M.

Mercury, Venus, Jupiter, Mars, and Neptune are evening stars at the close of the month. Saturn and Uranus are morning stars.

Project for Building a Railroad through the Cañon of the Colorado River.

Once more the project of building a railroad in the cañon of the Colorado River has come up for consideration, and this time in such definite shape that it would seem that before very long the undertaking would be actually begun. The project has always been a very popular one with engineers, owing partly to the almost insurmountable obstacles to be overcome. The country is so wild, the mountains so high, the walls arising on both sides of the river so precipitous and so lofty, that the mere work of surveying this district has been almost impossible. This, however, has at last been accomplished, and it is now announced that the work is by no means as hopeless as has always been supposed—in fact, that it is perfectly feasible.

In 1869, Major Powell, of the United States Geological Survey, made his memorable trip down the Colorado River, he and his party being the only persons who had ever succeeded in accomplishing this feat. Since then, several attempts have been made to accomplish this, but always fatally, and it was destined that this scientist should, for twenty years, hold the honor of being chief of the only party that had ever descended the entire length of the river. In 1889, a party of railroad men and surveyors started to make the descent of the river, and succeeded in reaching a point about the middle of the Marble Cañon, when disaster overtook them, and several of their number were lost. Since that time, however, the rest of the river has been traversed and examined, and the report of the chief engineer, Mr. Robert B. Stanton, has been handed in to the directors of the Denver, Colorado Cañon and Pacific Railroad Company.

In spite of the loss of life that has been met with in making the surveys, the report of the engineer is favorable, and he believes the work is practicable, not only from an engineering standpoint, but that the expense of building it will not be so great as to render the work impossible.

The entire length of the Colorado is about 2,000 miles, and it is navigable as far as Callville, a distance of some 600 miles from its mouth at the Gulf of California. The object of the present road is to connect the coal fields of Colorado with the Pacific coast. It is at present difficult to procure cheap fuel on the Pacific coast, much of the fuel used there being brought by steamer from foreign ports.

It is proposed to start the new road from Grand Junction, Colorado, which point is already connected with the coal fields by the Denver and Rio Grande Railroad.

The new road has been surveyed from that town to the Gulf of California, and also from the town of Yuma to San Diego, the most southerly seaport of California, this being a distance of 190 miles, and affording excellent communication with the Californian coast. The general survey has been divided as follows.

Starting from Grand Junction and proceeding toward the mouth of the river, we find the subdivisions to be as follows:

	Miles.
The Grand River	140
Cataract and Narrow Cañons	54
Glen Cañon	157
Marble Cañon	62
Grand Cañon	217
From Grand Cañon to the Needles	161
From Needles to Yuma and Yuma to Gulf	245

making a total of over a thousand miles.

The engineers, under the able direction of Mr. Stanton, have prepared an exhaustive report, with a detailed description of the work required to be done and the material encountered. By a very complete series of photographs, over 900 in number, each principal section of work has been put on paper, and the description refers to each photograph, by means of which the character of the work can be easily identified.

The first part of the route from Grand Junction down the Grand River to the head of the Colorado does not present any great difficulties. In fact, the Denver and Rio Grande Western R.R. have constructed a road along one bank of the river that is already in operation. The great difficulties of the route are not encountered until the great gorge of the Marble and Grand Cañons are reached. Of the 62 miles of road through the Marble Cañon, 26 miles are to be built on talus slopes, 33 on cliff bench work. There are about 2¼ miles of tunnel. The Grand Cañon is supposed to combine every difficulty that it is possible for the railroad engineer to encounter. Of the 217 miles through this section, 51 miles are hillside slopes, 43 heavy talus slopes, 11 miles cliff bench work, 19 miles marble bench work, 85 miles of sloping granite walls. Of the total length of the road, amounting to 1,019 miles, 403 miles are through what is known as earth work. This is not expensive work, and can be done with plow and scraper, as in any ordinary mountain country. The 86 miles of hillside slopes consist of earth and loose rock. The 191 miles of rough talus slopes consist of loose rock and bowlders and earth with slopes of stratified lime and sandstone. There are 99 miles of excavation through solid granite walls. There would be in all about 20 miles of tunnel.

Should this road be completed, it will open up a country that is practically closed to-day to the general traveler. The country is so rough and so extraordinary that only those who are especially favored with time, means, and physical strength can penetrate this wonderful region and enjoy its superior beauty.

Clarence E. Dutton, of the U. S. Geological Survey, in one of his reports, says that "Those who have long and carefully studied the Grand Cañon of the Colorado do not hesitate for a moment to pronounce it by far the most sublime of all earthly spectacles. If its sublimity consisted only in its dimensions, it could be sufficiently set forth in a single sentence. It is more than 200 miles long, from 5 to 12 miles wide, and from 5,000 to 6,000 ft. deep. There are in the world valleys which are longer, and a few which are deeper. There are valleys flanked by summits loftier than the palisades of the Kaibab. Still the Grand Cañon is the sublimest thing on earth. It is so not alone by virtue of its magnitudes, but by virtue of the whole—its ensemble."

Something New in Belting.

One of the most recent improvements in the line of belting for machinery is the Midgley wire belt, made by the Midgley Wire Belt Company, of Beaver Falls, Pa. It is not affected by heat, drought, or moisture; is nine times stronger than leather of equal weight, and far more durable. Among many examples of its use is that to be seen at Park Brothers' great steel works, where a 3-ply belt, 22 inches wide, 96 feet long, weighing 1,200 lb., has been run day and night for several months. It distributes the power of a 200 horse power engine to a train of rolls.

The Town of Tunnels.

At Port Huron, Mich., it is said there is a scheme to cut a third tunnel under the St. Clair River to Sarnia, to be used by street cars, foot passengers, and wagons. The Grand Trunk will begin work on their second tunnel soon.

ENGINES OF THE STEAM YACHT LADY TORFRIDA.

The Lady Torfrida was built by the Fairfield Shipbuilding and Engineering Company, Govan, Glasgow, for the late Sir William Pearce, Bart.

The engines of the Torfrida have five cylinders, two being high pressure cylinders 14¼ inches in diameter, and two low pressure cylinders 38 inches in diameter, and one medium pressure cylinder 30½ inches in diameter. This medium pressure cylinder is placed in the center and at either side of it is a low pressure cylinder with a high pressure cylinder above. The cylinders thus arranged work a three-throw crankshaft, the piston stroke being 30 inches. A piston valve is fitted to each high pressure cylinder, and an ordinary slide valve to each of the other cylinders. All the valves are worked by double eccentrics and link motion.

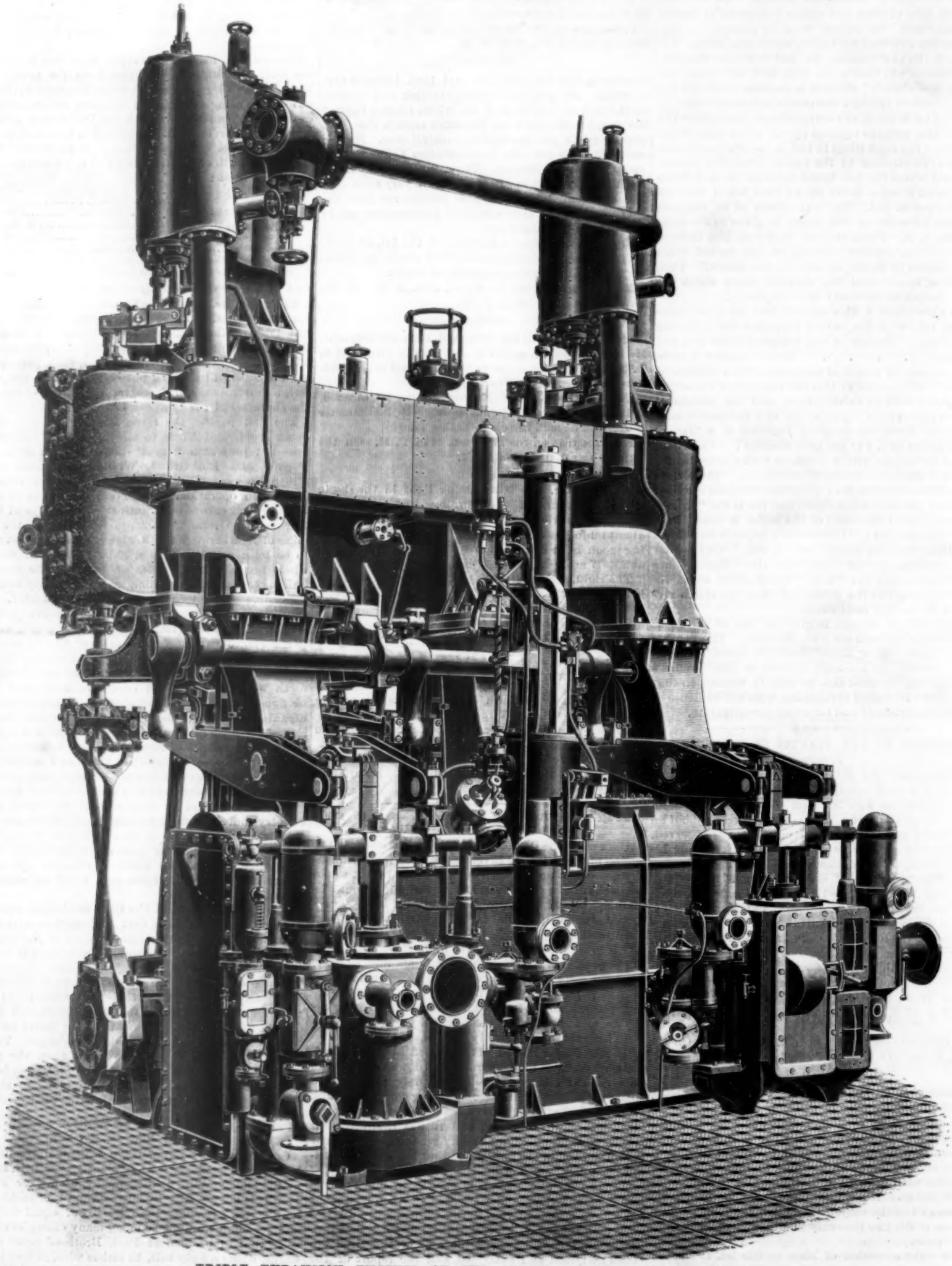
The crankshaft is in one forging and is, together with the tunnel, thrusts and propeller shafts, made of steel. The propeller has four movable blades of manganese bronze. The design of the engines generally comprehends all the newest appliances. Among other fittings, a feed water heater is fitted to the feed pipes.

There is an electric engine and a Kapp dynamo placed in the engine room, with a number of storage batteries, so that the light can be maintained throughout the ship for a considerable time without working the electric engines.

Steam is supplied to the engines by one single-ended boiler 15 feet 9 inches in diameter and 9 feet 5 inches long, having four corrugated furnaces. The boiler is constructed entirely of steel, for a working pressure of 150 pounds per square inch. The shell of the boiler is made in two plates only, which is an important feature in boiler construction of this size.

There is an auxiliary boiler fitted on board for supplying steam to the electric engines and for other subsidiary purposes.

The Lady Torfrida is of beautiful model. She has a clipper stem, with handsome figure head, and elliptical stern. She is 216 feet 6 inches long, 27 feet beam, and 19 feet depth moulded, and her tonnage is 735 tons. The vessel is schooner rigged, with long, rakish masts,



TRIPLE EXPANSION ENGINES OF THE STEAM YACHT LADY TORFRIDA.

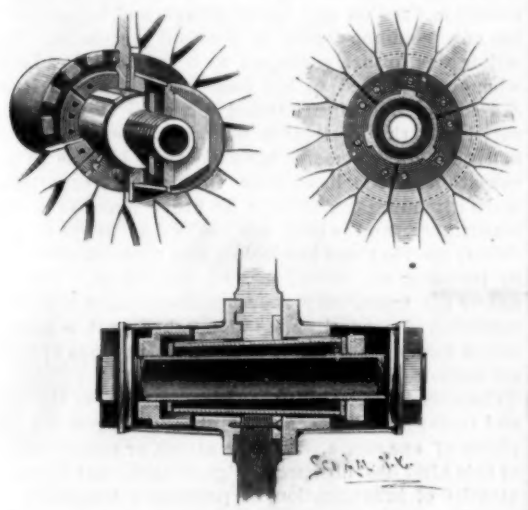
and is fitted with a steam windlass forward, and hand and steam steering gear aft, with a small steering wheel on the bridge amidships. All the deck fittings are of manganese bronze. There is a large steel deck house amidships, covered with teak, inclosing the engine and boiler space, deck saloon, and smoking room, and in addition affording entrances to the cabins forward and aft. The accommodation is well planned, and the decorations and furnishings do credit to the artistic taste of the late owner.

The accommodation for the officers and crew is provided aft, and for the former it includes a general mess room and cabin for each.—*Engineering.*

A NEW WHEEL HUB.

The engraving shows in three sectional views a novel wheel hub, in which the inner ends of the spokes rest upon a slightly elastic support, and in which the wheel is made expansible within certain limits to give it the required amount of "dish," and also to cause it to closely fit the tire.

A spindle box forming the central or foundation part of the hub is provided at opposite ends with an exterior screw thread for receiving at one end a plain nut and upon the other a cup-shaped nut. Between these two nuts is placed a conical sleeve of elastic material, and upon the conical sleeve are arranged flanges, each of which is formed in three segments. One of the flanges is furnished with inwardly-projecting lugs for locking the spokes. The spokes are connected by means of a segmental flange secured by bolts passing through alternate spokes into the flange upon the smaller end of the conical sleeve. The segmental flanges are arranged to register with each other, so as to permit of the expansion of the wheel. Metallic shells are slipped over the bosses of the segmental flanges and held in place by nuts upon the ends of the spindle box. A cup-shaped nut in the interior of the shell



HALL'S WHEEL HUB.

bears upon the boss of the segmental flange on the smaller end of the elastic sleeve.

When it is desired to expand the hub, the segmental flanges are moved forward by turning the cup-shaped nut. The conical elastic sleeve is provided with longitudinal ribs which fit in corresponding grooves in the other parts, and hold the parts in their proper relative positions.

The lower view shows the hub in section; the upper right hand view shows the parts before the flanges are applied, and the upper left hand view represents the hub with parts broken away to show the interior construction.

This invention is patented by Mr. Thaddeus M. Hall, of Grenada, Colorado; and Messrs. L. W. Markham and Thomas H. Cecil, of Lamar, Colorado, are owners of one-half of the invention.

New Green Vegetable Coloring Matter.

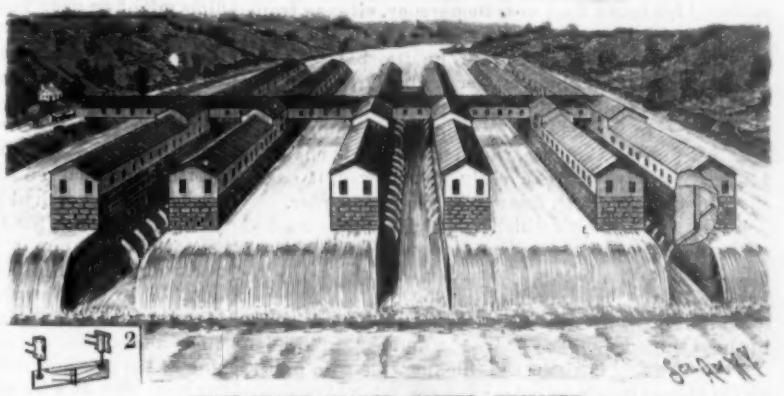
In a paper presented to the Royal Society of Edinburgh, Mr. C. M. Smith describes a green coloring matter obtained from the bitter green pulp of *Trichosanthes palmata*. The spectrum of the alcoholic solution of this substance differs from that of chlorophyl in its first absorption band having its center nearly midway between the two chief bands in the spectrum of true chlorophyl, while the bands III, IV, and V are probably coincident with corresponding chlorophyl bands. The behavior of this substance with ammonium sulphide differs altogether from that of chlorophyl. It appears to be a substance in which the "blue chlorophyl" of Sorby, or the "green chlorophyl" of Stokes, is replaced by some other substance easily decomposed by reducing agents and by acids.

Mr. C. B. Atwell records, in the *Botanical Gazette*, the occurrence of true chlorophyl in the embryo of *Tilia americana* and *Ipomœa purpurea*. In the latter species the chlorophyl makes its appearance as soon as the first traces of cotyledons can be recognized in a cross section of the seed, and it is abundant in the capsule while the seeds are developing.

IMPROVEMENT IN THE UTILIZATION OF WATER POWER.

We give an engraving of a novel device for utilizing the power of the falls of rivers and other watercourses where the fall is sufficient to permit of the application of the invention.

As will be seen by a reference to the illustration, a number of sluices or cuts are made in the river bed, which extend up the river. The walls of these cuts are lined with masonry which extends above the river bed to a point above the high water line, and upon these walls are built the mills or power houses. The spaces between the power houses or mills serve as canals or flumes for supplying water to the turbines located in the power houses. The penstocks for supplying water to the turbines are made by boring holes in the bed of the river and continuing them upwardly through the walls. A number of these penstocks are provided, and each one communicates with an inlet from the flumes, and at the lower end of the penstock is arranged an outlet for discharging the water from the turbine into the cut or tail-race between the buildings. Truss gates like that shown in detail in Fig. 2 are placed at the upper ends of the cuts or tail-races, to shut off the water, and cause it to flow around the power houses. Covered bridges extend between the power houses and communicate with them through stairways, the bridges being built on the top of the houses so as to be out of the way of any floating material that may come down the stream. The upper ends of the walls upon which the houses rest are provided with suitable ice breakers, and the gates at the head of the tail-races are made sufficiently strong to withstand any pressure that may be brought to bear upon them.



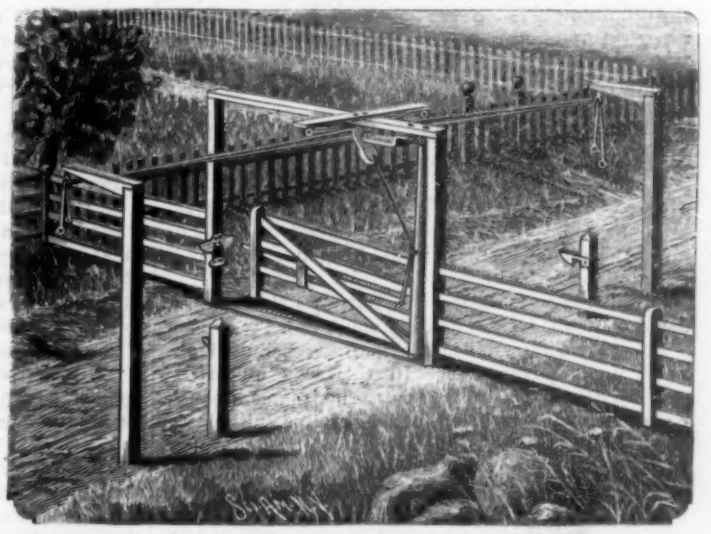
HIGH-GRADE WATER POWER UTILIZER.

This invention has been patented by Messrs. A. H. & A. Quain and G. P. Warner. Further information may be obtained by addressing Mr. A. H. Quain, Scio, Oregon.

A NEW FARM GATE.

We give herewith an engraving of a farm gate provided with simple and effective mechanism for unlatching and opening, and closing and latching the gate from either side, and for locking the gate in an open position. The gate is pivoted in a frame formed of the posts, a sill, and a cross bar connecting the tops of the posts, and the pivoted stile of the gate is extended to the upper cross bar. The inventor preferably extends a pivot from the center of the stile into the sill, but in some cases he uses ordinary hinges. In the gate is pivoted a long latch which extends from the free end toward the pivoted end, the end of the latch nearest the end of the gate being made heavier so as to cause the latch to close by its own gravity. To the gate post is secured a notched plate having beveled ends for receiving the projecting end of the latch.

To the upper bar of the frame in which the gate is pivoted is fulcrumed a lever carrying a toothed sector which engages a pinion on the upper end of the pivoted stile, and to the free end of this lever is pivoted a trip bar, the lower end of which is connected by a cord with the inner end of the gate latch, the cord passing though a guiding loop projecting from the stile of the gate. To the upper end of the trip bar are attached four cords, arranged in pairs, which extend in opposite directions. One cord of each pair extends through an eye supported by an arm attached to a post a short distance from the gate. The other cords pass over pulleys which reverse their direction; these also pass through the eyes supported by the posts. By pulling one of the cords, the trip bar is tilted, thus lifting the longer arm of the latch, and releasing the gate, at the same time a further movement of the cord operates the sector lever and swings the gate. Catches are provided for holding the gate open, and the operation of closing the gate is the reverse of that just described. This invention has been patented by Mr. Charles Oesterling, Barnhart's Mills, Pa.



OESTERLING'S IMPROVED GATE.

Richard Francis Burton.

Sir Richard Francis Burton, the famous African explorer, died on October 20 at Trieste. Sir Richard was born in 1821 in Hertfordshire, England, graduated at Oxford, and in 1842 joined the East Indian service. He commenced his explorations in the Neilgherry Hills, in India, and then acquired a wide acquaintance with Eastern languages. In 1851 he visited Mecca and Medina as a wandering dervish and wrote up his travels. He later visited East Africa, served in the Crimean war, and in 1856, with Capt. Speke, penetrated to the lake regions of Central Africa and discovered Lake Tanganyika. Since 1872 he had been British consul at Trieste. He published in all over fifty books of travels in Africa, the United States, Brazil, Palestine, Arabia, India, etc.

New Bleaching Fluid.

Ozonin, a bleaching fluid, patented by L. Schreiner, is made as follows: 125 parts resin are dissolved in 200 parts oil of turpentine, to this solution is added a solution of 22·5 parts potassium hydrate in 40 parts water, also 90 parts hydrogen peroxide. The resulting jelly exposed to light changes in 2 or 3 days into a thin fluid called ozonin, this same change takes place in the dark, but then requires some weeks for its completion. An emulsion of one gramme ozonin in one liter water acts as an energetic bleaching agent on fibers, wood, straw, cork, paper, also on solutions of gums and soaps; the bleaching effect is as energetic in acid as in alkaline solutions.—*Chemiker Ztg.*, 1890, 1004.

A Process for Recovering Tin.

The French Society for the Encouragement of National Industry have given the prize allotted for the utilization of works' residues to M. Martinon, for his process of recovering the tin contained in the wash waters from silks which have been treated with bichloride of tin, for the purpose of giving weight. By adding milk of lime to the water, and by properly agitating, the tin settles down in a few hours in the state of oxide, which can be readily collected and disposed of. This economy is said, for Lyons alone, to effect an annual saving of $60,000.

HUDSON MAXIM, of Pittsfield, Mass., brother of Hiram Maxim, the well known inventor, has developed a new smokeless powder for guns, that has, so far as tested, merited the eager attention of army officers. The production of a new small caliber rifle is entirely dependent upon the result of tests of this class of powder, and at present the tests made with the Maxim powder give gratifying evidences of success.

ONE of our leading doctors says a potato is most digestible if boiled in its jacket.

Celluloid as a Drawing and Printing Material.

[THE LITHOGRAPHIC ART JOURNAL.]

Some experiments have lately been made here with celluloid as a material for drawing and printing upon, in connection with photographic processes of reproduction, and a brief account of the results may not be uninteresting.

The advantages celluloid possesses as a drawing material are:

1. Its great translucency, which enables tracings to be easily made upon it, and also renders it an excellent material for being used as transparency, either a transmitted positive or negative, for photographic printing.

2 Its impermeability to and unabsorbativeness of water or moisture, which render it quite free from any liability to be affected like paper by hygrometric changes, or to be attacked by mildew and damp.

3. The fine matt surface, which takes pencil, chalk, or ink very readily, and can easily be renewed, if necessary, by graining with fine sand or emery powder.

4. The facility with which drawings can be washed off and renewed for purposes of correction, or for making new drawings. The surface can also easily be kept clean and free from dirt.

I have tried the material as obtained from America in three thicknesses, the $\frac{1}{100}$, $\frac{1}{150}$, and $\frac{1}{250}$ of an inch thick. The first is about the thickness of thin paper, and is almost free from color; the second, which seems to be the kind in ordinary use for negatives, etc., is about the thickness of a sheet of stout writing paper, and shows a light buff color if laid on white paper; the third is about the thickness of an ordinary playing card, and shows a strong buff color over white paper.

On account of its freedom from color and great flexibility, which would permit of its being rolled without damage, the thinnest kind would probably be found the most suitable for drawing upon; but as the surface of the sample sent me was not so evenly grained as the others, I used the medium kind for the trials. It was found that a soft blacklead pencil worked very pleasantly on the matt surface, and gave a fair opacity of line when viewed through the film, so that pencil drawings on this material might be copied in fac-simile very easily by various photographic processes. Black chalk also works very well, and gives more opacity in the lines than the lead pencil does. The softer kinds work better than the hard. With the latter, as with hard lead pencils, there is a tendency to make lines which polish the surface, and render it transparent when viewed through the film.

India ink drawings in line can be made with perfect fineness and delicacy with pen or brush; but, so far as I have tried, it is not easy to produce shaded or colored tints in washes; the surface of the material is too unabsorbent, and cut shades are produced on drying. Stippling or work with the air brush would probably answer better for shaded drawings in India ink or color.

Our trials have already shown that drawings in pen and ink, and in chalk, on celluloid can be reproduced very effectively on copper by the photo-etching processes, either by the direct methods, in which asphaltum or bichromated albumen is used as the sensitive surface, or in the manner used for half tone heliogravure work with carbon tissue. In the latter case the drawing must be reversed, unless the film of celluloid is thin enough to allow the drawing to be printed with sufficient sharpness through the film. The drawings would also be suitable for reproduction by certain of the block processes now in use. For all fac-simile work, negatives could easily be obtained by contact printing on dry plates.

The drawings can, in fact, be reproduced by any of the photographic processes now used for reproducing tracings; and as the material is perfectly free from all inequality of grain, is sold in large sheets, and will soon be obtainable in continuous rolls, it seems likely that it might well replace tracing cloth or paper for all copying or tracing purposes, and especially for photographic work. If not required to be kept, the drawings can be washed off, and the same materials used over and over again. For sketching purposes the celluloid would be very useful, and could be made up into blocks like paper. It would keep much better in damp climates than paper.

For drawings for decorative purposes the material could no doubt be also usefully employed.

For preparing factitious negatives, celluloid also offers great advantages. In this way an artist's original drawing in India ink or other pigment can at once be turned into a reverse negative suitable for photo-mechanical printing by the collotype processes, or by any of the block processes, depending on a direct photographic impression made on a zinc plate coated with asphaltum or bichromated albumen or gelatine. For this style of work, lamp or ivory black, with a little gum, is the best ink to draw with. As soon as the drawing is completed, it is evenly coated with a mixture of lamp black and gold size, as suggested by Major Gore, R. E., or with printing ink and turpentine and a little gold size, so that it may dry quickly. As soon as this is the case, but not before, the film is placed in water, which will at once clear the ink off the lines of the drawing, leaving them quite transparent against the opaque ground. For fine work a little clearing with a sponge may be necessary.

The new films have been tried as a printing surface in place of stone or zinc, and have been found to answer fairly well, excepting that it is very difficult to keep the ground clear and white, and free from a slight dirty tint. Gum and gelatine, with various acids, and with bichromate of potash, have been tried as "etching" preparations, but so far without effect. If with further trial this defect can be overcome, the films might be very valuable as a substitute for stone or zinc in printing. With the delicate cream color of the stone, which is so much pleasanter for draughtsman's work than the dark gray color of the zinc plates, they possess all the lightness, portability, and infrangibility of the latter, without their liability to corrosion. Their ready flexibility would be of value in printing from curved surfaces.

I have not yet had an opportunity of trying the films as a support for the gelatine printing surface in collotype work, but it seems most probable that the thicker kind of celluloid ($\frac{1}{50}$ of an inch thick) would be suitable for this purpose, and would have the great advantage over glass plates of not being liable to break. The transparency of the films would admit of the sunning of the gelatine coating from the back in exactly the same way as with glass plates. Thin films of this material coated with insoluble gelatine might be useful for printing in the "Autocopyist."

The celluloid films can be printed on from stone or zinc fairly well, though the ink takes some time to become thoroughly dry. Printing from copper plates was not found to answer. Type can also be printed from, but the impressions obtained were not very good, and the type indents the films very much, but further trial might give better results. Such prints from type would be useful in a variety of ways for typing names and titles, etc., on heliogravure plates, and for many miscellaneous purposes. The impressions from type are rather too weak to use at once for photographic printing, but they can easily be strengthened by brushing over them some red bronze powder.

For drawing with lithographic transfer ink the material does not seem at all suited. The ink works heavily in drawing and spreads in transfer. But celluloid forms a good material for dry point etching or printing in the copper plate press, and by heating it and pressing it into a cast from a form of type, stereotype blocks can be made which stand the wear of printing well; these applications I have not, however, yet tried.

The acquisition of a material like celluloid, obtainable in sheets of large size and fine surface, which is practically transparent, inextensible, and unabsorbent of moisture, and not readily acted on by most acids (acetic acid attacks it), is a great advance for all work connected with photography and printing, and it seems probable that we may see a very large extension of its use in these directions before long.

J. WATERHOUSE.

Queer Kinds of Coins—Interesting by Reason of Their Age and for Other Causes.

"Here is the oldest coin ever made in the world," said a collector to a reporter for the Washington *Star* one day recently. "It was made about the year 700 B.C. in Ægina, and you will observe that the design in high relief represents a tortoise crawling across the face of the piece. You will not find any date upon it, because no coin were dated prior to 400 years ago. The most beautiful coin ever made, in my opinion, is this silver piece of Macedonia, which was current in Macedon, now Constantinople, 500 years before Christ, or 200 years earlier than the time of Alexander the Great. Though its face value is only fifty-three cents, the coin is worth a price to-day that would astonish you.

"Here is a specimen of the coin of smallest value ever issued. It is the 'mite,' so called, such as the widow of the Bible story dropped into the slot for the poor, though it was her last one. One-fiftieth of a cent it was worth, and you observe that its shape is hexagonal. Close by you will notice a piece of money worth $220. It is simply a rectangular piece of gold, stamped with the characters of China, from which country it comes. Lumps of gold are used in China for currency of large denominations.

"This coin with the head of the beautiful woman upon it, so exquisitely designed, was minted in Egypt during the reign of Ptolemy Philadelphus, 2249 years before Christ. The lovely head is a likeness of Ptolemy's wife and queen, Arsenoe, who was grandmother by six removes to the famous Cleopatra. I put it that way because there were in reality several Cleopatras, though most people imagine there was but one.

"Here is a gold piece that was issued by Darius the Great before the children of Israel returned from the captivity. This is something comparatively modern—the 'marriage piece' of Ferdinand and Isabella, issued to celebrate their union some time before Columbus discovered America. Here is the smallest coin ever issued—the thirty-second of a ducat, minted in the year 1560 A. D. in the free city of Nuremberg. It was worth 7¼ cents. By the way, it was the Swiss who first put dates on their coins.

"Perhaps the funniest coins in the world are these roundish irregular lumps of silver from Siam, running down from the bigness of a walnut to the size of a buckshot, according to value represented. You will notice from the display of United States coins in this other case that during the first year when we coined money in this country, in 1792, we had nothing but copper. In 1794 we obtained some silver from Mexico, and two kinds of silver coins appear. Not till 1765 did we have gold coins, consequent upon the discovery of that precious metal in different parts of the United States."

Headache and Aching of the Eyes.

Eye strain should be the first thought suggested by any complaint of headache, for in our day and civilization it is by far the most common cause of that symptom. It enters as a factor into the causation of nearly all headaches not due to pyrexia, toxæmia or diseases of the brain or its membranes. The simple existence of headache, therefore, should suggest eye strain, but frequently a careful inquiry as to the manner and time of occurrence of the attack and the location of the severest pain will be almost conclusive as to the origin of the trouble.

Often it comes on whenever the eyes are used, and is absent when the eyes have had a proper season of rest. The occasions of most severe requirement in the direction of eye work are the doing of anything requiring accurate near vision, taxing both the accommodation and the convergence, or traveling, shopping, attendance at public gatherings, which entail more use of the eyes than the patient is at the time conscious of, and often under unfavorable conditions.

In hyperopia in young people, the accommodation is in excessive use so long as the eyes are open and the attention fixed on any visible object, and hyperopia is the most common cause of constant headache. The writer was formerly subject to a constant headache whenever confined to the house, and regarded it as caused by breathing vitiated air, until it was quite cured by the correction of his hyperopic astigmatism. Many persons have the same idea as to the causation of the headaches they always experience when attending the theater or other place of public amusement, and which are really due to eye strain. Others ascribe these headaches, and those experienced in traveling and shopping, to exhaustion. This is nearer the truth, only they commonly have in mind a condition of general exhaustion, whereas it is largely one of local exhaustion of the special nervous apparatus concerned in the act of seeing.

Congestion, irritability, or inflammation of the eyes and their appendages, should always suggest the suspicion of eye strain. A single attack or manifestation of this kind has no special significance, but repeated attacks of inflammation, or prolonged congestion, or irritability are exceedingly suggestive of a continuing cause, and the most common of these is the one now under discussion. No case of chronic inflammation of the margins of the lids, or of recurring conjunctivitis, or repeated sties, has justice done to it until it has been carefully investigated for eye strain. Persons at the period when they begin to feel the effects of the loss of accommodation in presbyopia or absolute hyperopia suffer from repeated attacks of conjunctivitis, which they commonly ascribe to "taking cold in the eye," but which are cut short by use of the appropriate lenses, and which, if unchecked, would tend to establish a chronic catarrhal condition, which is a chief discomfort in the lives of many people.

I should like, also, adds the editor of the *Times and Register*, in a recent issue, to call attention to car sickness in connection with eye strain. I have had eight or nine cases of this kind, all of which were relieved by glasses. One case was that of a gentleman who every journey had car sickness. While he had the mydriatic in his eyes he went to Washington, and suffered no inconvenience whatever. Subsequently, after he had glasses, he made a trip to St. Paul without any of the former trouble. Recently I have had two cases—one that of a girl who could not ride a short distance in the street cars without vomiting. I found a decided degree of hyperopic astigmatism. With the mydriatic in her eyes she rode home without her usual trouble.

A strange thing with reference to eye strain is that it often exists to an exceptional degree without showing any symptoms in the eye. The patient will often say that the eyes are perfectly good and have never caused any irritation. The reflexes seem to have settled in some other place. This is an interesting pathological and physiological question.

CONGRESS has passed an appropriation of $350,000 for the purchase of the Portage Lake and River Improvement Co.'s canal and the Lake Superior Ship Canal Railway and Iron Co.'s canal. These works connect Portage Lake with Lake Superior, and will now be made free from tolls. The copper-mining industries will be greatly benefited by this action of Congress.

Correspondence.

Belt Crawls.

To the Editor of the Scientific American:

The communication entitled "A Belt Problem" calls to mind a discussion in the *Mechanical News* a few years ago in regard to the same subject, and in which the first writer observed the same phenomenon that Quirk mentions.

The "crawl" of the outer belt is explained by the fact that it runs on a pulley larger, by twice the thickness of the belt, than that on which the inner one runs, and, provided there were no loss, it would gain the thickness of the inner belt, say $x \times 2 \times 3{\cdot}1415 +$ at each revolution. It is readily seen from this that if the pulleys are of different sizes, and make a different number of revolutions, the outside belt will gain more rapidly on the smaller pulley, thus causing unequal tension.

In case the small pulley is the driver, the outside belt will be tightest on the working side, which, provided the difference were not too great, is as it should be; but if the driver is the larger, then the outer belt would be slack on the working side and have a tendency to hold back; which would go far to overcome the advantage gained by the extra grip given by the extra weight, and would certainly add much to the strain on the inner belt, which would not only have to do all the work, but overcome the "crawl."

The use of a double belt becomes then a useful makeshift in some cases, where the driver is slightly smaller or of the same size as the driven; but in other cases there is probably more loss than gain, and even under favorable circumstances it is of questionable utility for continued use, as the slip of one belt upon the other would probably cause a great amount of wear; and the two belts run side by side, or a single belt of twice the width, would be much more durable and give more power. W. D. G.

Cloquet, Minn., October 13, 1890.

Water Supply Systems Compared.

At the recent meeting of the American Society of Civil Engineers, Mr. J. Leland Fitzgerald read a paper devoted to a comparison, from the financial standpoint, of different systems of water supply to towns. The author compared the gravity system, reservoirs, and direct pumping; concluding that for large towns the efficiency of the two former is the same, while direct pumping is superior by 20 per cent. The advantages of reservoirs are better fire protection, economy in running expenses, and purer water. Mr. Fitzgerald declared that, whatever the size of the town, a gravity system of supply is preferable whenever the following conditions are all fulfilled: A supply of unquestioned present and future purity; quantity sufficient for the needs of the next 20 years without great additional outlay; and the original cost such that 8 per cent thereon is not in excess of 60 per cent of the total working expenses, including interest and sinking fund. A direct pumping system is the most economical when the town is large enough to take half a million gallons and upward daily; when the supply is good and abundant, although found at a low level; and when there are no great differences of level in the distribution system. If there are highly elevated portions of the same district, these, if small, are best supplied from a separate reservoir fed by a force main. When the consumption of a district is less than half a million gallons daily, direct pumping with a reservoir of at least 20 hours' capacity, situated in the distribution system, is the most economical. When a town supply is intermittent, of course a reservoir capacity sufficient to afford the requisite storage for periods of drought is necessary. Although the author admitted that no hard and fast rule can be made in a matter of this sort yet a few general principles like the foregoing are useful aids to the treatment of doubtful cases.

A Gas Value Indicator.

In view of the difficulty experienced by the general run of gas consumers in checking their gas bills against their meter register, Mr. J. L. Cloudsley, of Smith Square Works, Westminster, has devised a cash value indicator for gas meters. This consists of a dial placed on the front of the meter and having around its edge figures, each representing 100 cubic feet of gas, from zero to 1,000. Under each of these figures is the cost of the amount of gas represented by the figures at a stated price per 1,000 ft. The quantity consumed is indicated by a pointer, which is worked from the ordinary indicator of the meter, and after 1,000 ft. of gas have been used, this is indicated on another dial within the priced one: the pointer then going on to indicate a second 1,000, and so on. The dial is made of cardboard, and, should the price of gas vary, the dial will have to be removed and replaced by one showing the altered price. It is conceived that this arrangement will lead to the use of gas by many small consumers who distrust gas meters because they cannot understand them, and who doubt the correctness of gas bills because they cannot check them.

The San Jacinto Tin Mines.

A recent number of *The Engineering and Mining Journal* contains a description of the tin deposits of San Jacinto, San Bernardino County, California. In some respects, says our contemporary, these tin veins are the most promising yet discovered in the United States. Many of the veins are large; they occur in a congenial country rock, and the vein characteristics are, to the miner, favorable and promising.

"The experts' reports given in the prospectus of the company, which are said to show an *average* richness of 20 per cent of black oxide of tin (say 15 per cent of metallic tin) in the ore, are wholly misleading, and, we think, will certainly not be realized. From a recent visit to the mines, during which we were courteously extended every opportunity to examine the property, we feel justified in saying this, but such an *average* richness is quite unnecessary. The greatest tin mine in Great Britain, the Dolcoath, carries 2 to 3 per cent of tin, and though it costs $6 or $6.25 a ton to mine and mill the ore and cover all expenses, the company pays large dividends. Now it is certain that the San Jacinto mines can be worked at a *less* cost per ton than is done in Cornwall, because everywhere in this country we get so much more to the man that it more than compensates for the difference in wages paid. There is no mine in Cornwall that is to-day mining and milling ore as cheaply as are fifty mines that could be named in Michigan, Dakota, Montana, and California, where miners' wages rise to $3 and $3.50 a day. San Jacinto could, therefore, pay larger dividends than Dolcoath out of ore of the same grade, and probably all the investors would be satisfied to be guaranteed Dolcoath's rate of dividends. The same is true of the tin mines of the Black Hills, of Dakota, which we recently had the pleasure of visiting. Systematic work is being done, with encouraging results, in Dakota, yet there the judicious plans adopted do not contemplate the erection of mills and reduction works until large reserves are ready for extraction."

The recent announcement of the sale of the San Jacinto tin mines to an English corporation is confirmed.

The Rancho Sobrante de San Jacinto, as patented by our government, consisted of eleven Spanish leagues, or about 48,400 acres. But the mining company disposed of about 3,500 acres to the town of Riverside, so the present property consists of about 45,000 acres, or about 70 square miles. The tin district is, in a straight line, about ten miles south of Riverside, in San Bernardino County. Also it is about fifty-five miles easterly from Los Angeles, and fifteen miles southerly from Colton, a station on the Southern Pacific Railroad. The California Southern Railroad, running from Colton to San Diego, passes the property on the east, about three miles from its boundary; the Riverside, Santa Ana and Los Angeles Railroad passes within a mile or two of the most westerly veins on the tract, and the Pomona and Elsinor Railroad (in process of construction) will skirt the southerly boundary, along Temescal Creek; so the property is now virtually surrounded by railroads.

Temescal Creek will supply an ample amount of water for dressing the ore; but it may be necessary to construct a bed-rock dam to bring all the water to the surface.

The tin veins are found in the low, rolling hills of the San Jacinto mountains, the Gabilan hills, and are elevated several hundred feet above the creek, offering an excellent opportunity for cheap working by tunnels, if sufficient ore is found.

The country rock is composed of syenitic granite, syenite, and slate; but the veins apparently extend but a short distance into the latter. Veins of porphyry and quartzite cut across the country rock in various places, but in a direction different from that of the mineral veins which pass through them, showing that the former were made first. The courses of the veins vary from north and south to east and west, swinging around gradually from the former to the latter direction as one goes from the west to the east. The hills are entirely destitute of all vegetation excepting the native grasses, which enables one to see readily the black croppings of the veins, which may be said to be unique in their distinctness. By standing on the summits of the higher hills one can see them running across a level space, climbing a hill, extending down the other side, crossing a gulch, running up another hill, down again, and so on, continuing in the same plane with unusual regularity. Again, a slide on the side of a hill exposes a vein standing almost perpendicular, and as black, nearly, as a seam of coal.

The widths of the veins are, of course, not uniform; they vary from 18 inches to 30 or more feet. The widest one measured was found to be 24 paces—say 60 feet—in width, and it was a most promising one, too.

From the most westerly to the most easterly vein the distance is, as the crow flies, about three and a half miles, and within this space upward of 70 lines of croppings of apparently as many different veins were found. They were practically identical in character; a sort of syenitic rock which, in Cornwall, is known as "tin capel," or "lode granite." With the exception of the more extensive ones on the Cajalco lode, the developments consist of a number of "test pits" sunk to various depths—usually from 2 to 12 feet—in the croppings of different veins, all of which show more or less of the black and white mottled ledge matter that is so characteristic of this locality. In some instances copper is found in the ore in considerable quantities; in others it is found only as a stain; and, again, it is not seen at all. Silver, gold, and nickel are said to be found there also.

It is extremely doubtful if any deposits of tin ore so far discovered in the United States can in any way approach those of the San Jacinto district in closeness of resemblance to the lodes of Cornwall. As for the richness of the ore and the quality of the tin produced, these points remain to be more fully determined by the new English corporation or its successors.

The San Jacinto Estate, Limited, has a share capital of £505,000, which is divided into 500,000 ordinary shares of £1 each, and 1,000 founders' shares of £5 each. Also £125,000 of debentures will be issued, making a total capital of £630,000; or, at $5 to the pound, $3,150,000. It is also stated that the price to be paid for the property by the English corporation is $400,000 in cash and £250,000 in ordinary shares. The amount already paid is known to be $350,000 cash. Of this sum $300,000 were paid to the shareholders of the old company, leaving $50,000 to be used, presumably, for various expenditures made in connection with the sale. If the above statement as to the amount to be paid for the property is correct, then the promoters will receive $50,000 in cash and $1,250,000 (£250,000) in shares. Then it is stated that $250,000 (£50,000) in cash have been placed in the treasury of the company as working capital, so the total cash outlay is $650,000. This just equals the sum of the debenture capital, £125,000, and the founders' shares, £5,000. Hence the ordinary shares seem to be "distilled" water. The new company, therefore, starts in business with a total capital of $3,150,000. Six per cent per annum on that amount is $189,000. To make $189,000 per year it would be necessary to treat about 45,000 tons of ore annually, or 150 tons per day for 300 working days.

In addition to the probable worth of the tin veins, the property acquired by the San Jacinto Estate has a large value for agricultural purposes, as a part of the land can be irrigated by a suitable system of storage reservoirs, and possibly by artesian wells. Such land is now worth $100 and upward per acre. Also, the water in Temescal Creek could be used to irrigate adjoining land. So that if the tin veins, in spite of their promise to the contrary, should prove to be comparatively valueless, the entire amount of cash paid for the property, and perhaps much more, could probably be realized from sales of land and water.

Bad Effects of the New Antipyretics.

Excluding the effect of heroic doses, and considering only those which are ordinarily regarded as medicinal, Dr. Goldmann is led to the following conclusions:

Antifebrin.—Individual susceptibility to this drug differs widely. Even the smallest doses are capable of giving rise to dangerous symptoms. Especial caution is necessary in using it among children. Its continued administration begets a cumulative action. Collapse, cyanosis, vomiting, and profuse sweating not infrequently result.

Antipyrin.—Neither may any absolute dose be stated of this substance. It also needs to be used with prudence among chidren. It also possesses a cumulative power. Exanthems, collapse, cyanosis, dyspnœa, vomiting, and excessive perspiration are often its effects. That death sometimes follows the exhibition of comparatively small quantities admonishes us to prudence.

Phenacetin.—Eruptions and copious sweats are not infrequently occasioned, the latter especially in persons predisposed to free perspiration. Cyanosis and collapse are of less common occurrence. It should be given cautiously to children.

Without expecting it to take the place entirely of the other two bodies, phenacetin may well be preferred to them in many cases, especially in regard to the fact that it is less liable to create embarrassing and dangerous manifestations.—*Med. Bulletin.*

Remains of a Great Mastodon.

The skeleton of a mastodon found at Higate, forty miles west of St. Thomas, Canada, is on exhibition in that town. The area of the grave where the monster's bones were found is 35 by 21 feet. The bones were scattered over it, one joint fitting into the other in a bed of gray marl about six feet below the surface. Over the marl is a thick layer of black, loamy soil. The length of the animal, gauged by the measurements of the bones already found, and allowing for those that have not yet been discovered, is, from the point of the nostril to the root of the tail, about twenty-two feet. This is greater than that of the celebrated *Mastodon giganteus* discovered near Newburg, N. Y., in the summer of 1845, and the skeleton, as a whole, is larger and more complete than any that have been found in Kentucky, Ohio, Missouri, California, or Oregon.

The Bogoslov Volcano.

The most interesting result of the recent trip of the Rush was a visit paid by the officers to Bogoslov Island, where is the famous volcano of that name. In conversation with one of the officers, an interesting *resume* was obtained of the discoveries and data gleaned by the visit. Bogoslov is sixty miles west-southwest of Oonalaska. It originally consisted of one island with two craters, one of which first sprang into activity in 1792.

Last winter the island was the scene of a strange convulsion of nature. The second crater, now known as New Bogoslov, became active. In some powerful convulsion the sandspit which had connected the two parts of the island was submerged, and one crater was separated from the other by several fathoms of water. It is thought that during this convulsion changes occurred in New Bogoslov below the water line; that fissures were opened, through which volumes of water made their way into the caldron within. This accounts for the immense quantities of steam which the officers of the Rush saw escaping from the crater at a distance of fully sixty miles.

Of the two craters, New Bogoslov offered the most interesting field of study to the officers of the Rush. They ascertained the crater to be only 200 feet above the sea level. The peak had disappeared in the gaping hole. Along the sides of the volcano large deposits of lava, pumice, ashes, and volcano rock were seen. From fissures on the level earth springs of boiling sulphur arose to heights of from seven to ten feet. The officers planned an ascent to the crater—a hazardous feat which could only be attempted when a favorable wind carried the sifting volumes of sulphurous steam in a single direction. When near the mouth of the crater the footfalls of the officers were echoed within the volcano. On peeping over the edge of the mouth an impressive sight was witnessed. Steam in endless quantities rushed up from unknown depths, and rumbling, bubbling noises, like that of thunder, were heard. The air was impregnated with sulphur, and near the crater one could breathe only with difficulty.

One of the most novel discoveries in connection with the ascent was that the ocean birds used the volcano island as a natural incubator for their young. Thousands of gulls flew away at the approach of the Rush. They left behind them, along the sides of the volcano, eggs in all stages of development.—*San Francisco Chronicle.*

AN IMPROVED WATER CYCLE.

Since one general form has been adopted for the main frame and the principal parts of the cycle as it is commonly seen on the street and road, the improvements in these machines are limited to the details, and consequently inventive genius has turned with renewed zeal to the construction of the water velocipede. To the several forms already known is now added the water cycle built according to the ideas of Joseph Korner—who has a foundry in Olmutz—the arrangement of which can easily be seen from the accompanying drawings. The seat for the rider is placed above the single high wheel, and from here the rudder, which is located in front, can be operated in a simple manner. Iron, steel, brass, and wood are used in the construction of the machine, and it weighs about 156 pounds. It can move in any direction at a very good rate of speed, carrying, if desired, another person besides the driver, his weight being about 136 pounds. The machine can be taken apart for transportation, and by loosening or tightening four screws the parts can be shifted so as to be horizontal. Its movement is smooth and regular, there being no uneven oscillations. To the flag staff, which holds the rudder in a horizontal position, a sail can be attached, thus increasing the speed four or five times. The rider can use the two oars, shown resting on the forks, in pushing the machine off the sand banks without dismounting. Trials of the water cycle have been made in the neighborhood of Olmutz which have been remarkably successful. In one of these trials a distance of more than a quarter of a mile was covered in four minutes up stream, and in two and a half minutes down stream. The numerous turns were made with perfect safety.—*Illustrirte Zeitung.*

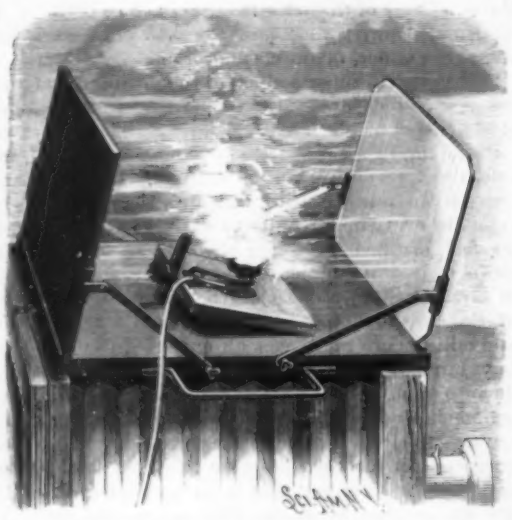
IMPROVED WATER CYCLE.

Electric Elevated Roads.

Elevated railroad schemes are very numerous in Chicago at present. Articles of incorporation have been issued for another rapid transit company which proposes to construct an elevated road upon the north side of the city to be operated by electricity. This is a section of the city which needs increased rapid transit facilities, and an elevated road may be all right, but the question is, Will it be operated by electricity?

A DEVICE TO FACILITATE TAKING PHOTOGRAPHS BY FLASH LIGHT.

The shadows caused by the brilliancy of the light, and reflections from polished surfaces, when pictures are taken by flash light frequently make it impossible to obtain the best results. To obviate this difficulty the device shown in the accompanying illustration has been provided, consisting of a base adapted to be supported upon a camera, and holding in position a translucent plate at one end and a reflector at the other end, while between them is an adjustable shelf adapted to support a magnesium lamp, or upon which magnesium may be burnt. The base is composed of two boards, with strips between their ends and one upon one side, so as to form between the boards a shallow pocket to receive the translucent plate and the reflector, whereby the device when taken down may be packed in small space for transportation. The plate and reflector are held in upright position, resting in transverse grooves in the ends of the base, by means of arms pivoted to the base and provided at their other ends with clamps or holders adapted to receive and hold the plate and reflector at the desired inclination. Hinged centrally upon the base is a shelf, provided at one end with a slotted bar and set screw, to raise or lower that end, to give any desired inclination to the lamp base to get the best effect of the light. When this device has been properly adjusted upon the camera to cause the light to be diffused in the direction of the object to be photographed, the quantity of light flashed by the burning magnesium is preserved, while it is made uniform by diffusion, lighting up all points, reducing and mellowing the shadows, and avoiding reflections and interference from the presence of polished objects. For further information relative to this invention address the patentee, Mr. John S. Bridges, 15 South Charles St., Baltimore, Md. The apparatus can be folded into compact form for transportation, as may be seen from the small engraving.



BRIDGES' PHOTOGRAPHIC FLASH LIGHT DIFFUSER.

DIFFUSER FOLDED.

Antimony Hypodermically for Apoplexy.

In the *Medical Bulletin* (July, p. 243) Dr. J. F. Bird reports some interesting clinical notes respecting the hypodermic use of tartarized antimony in the treatment of apoplexy. Its sedative action is highly indicated, whether the condition be arterial or nervous excitement, or both combined.

He first used it in the case of the late Dr. James McClintock. On reaching the house, he found the doctor lying on the floor, having fallen from the sofa on which he had been sitting. The respiration was hurried, but there was no stertor. Pulse 120, but not full or strong. Three or four doctors who had preceded him pronounced the case hopeless. No medicine could be administered by the mouth, and blood-letting was inadmissible. He immediately injected half a grain of antimony—tartar emetic—hypodermically, and very soon the pulse began to fall, and the hurried respiration abated. In half an hour he repeated the operation, and soon found all the bad symptoms subsiding, and the patient passed a quiet night. Next morning he was perfectly conscious, and made a rapid recovery so far as the apoplexy was concerned. His next case was a Mr. Klein, who had fallen to the floor very suddenly, but with symptoms very different from those of the previous case. This man had violent convulsions, a rapid and full pulse, with stertorous breathing. Two physicians were with him, and regarded the case as *in extremis*. At Dr. Bird's suggestion one of them injected a fourth of a grain of antimony hypodermically, and in a few minutes the stertorous breathing became less marked, the pulse began to fall, and the convulsions became less violent. The doctor injected another fourth of a grain of antimony, when all the violent symptoms abated. Two hours afterward the man sat up and was taken to his home.

In another instance he was called in the night to see a Mr. Hance, who was seized in a manner similar to the foregoing cases. He was convulsed; skin hot and red; pulse greatly accelerated, but not very full or strong. Respiration was greatly quickened, and breathing stertorous. He was perfectly unconscious. Dr. Bird resorted at once to the antimony, using a fourth of a grain, which had a marked effect upon the symptoms. In about twenty minutes he repeated the dose, and had the satisfaction of seeing all the symptoms subside, and a state of semi-consciousness return. In this case, because of the general turgidness of the face and neighboring integuments, he had a few cups applied, but allowed but little blood to be taken. There was no further trouble, and in a few days he was able to resume business.

Summing up his article, Dr. Bird is of opinion that for the treatment of apoplexy tartarized antimony is an invaluable therapeutic agent hypodermically administered. The same mode of treatment may be resorted to in canine practice when valuable dogs are attacked with fits.

New Style of Fly Wheels.

A novel fly wheel, of large dimensions, which differs materially in construction from those ordinarily in use, has been designed by Messrs. Mannesmann, to guard against the terrible danger of bursting, to which accident cast iron fly wheels are only too subject when worked at a high speed. This wheel, which is in operation at the Mannesmann Tube Company's works, in connection with their process for making seamless tubes, consists of a cast iron hub, to which are securely bolted two disks of steel plates, about twenty feet in diameter. Round the periphery of the wheel thus formed, about seventy tons of No. 5 gauge wire are wound, under a tension of about fifty pounds, thus binding the whole securely together. There can be no comparison between the resistance of a wheel so constructed to the centrifugal force and that offered to this force by a cast iron one. This fly wheel, of twenty feet diameter and weighing seventy tons, revolves 240 times per minute, therefore the periphery of the wheel has a speed of 2·85 miles per minute, or nearly three times the speed of the Flying Dutchman. It works on the main shaft, from which the tube mill is driven by means of helical toothed steel wheels.—*Specialties.*

EVERY year a layer of the entire sea, fourteen feet thick, is taken up into the clouds. The winds bear their burden into the land and the water comes down in rain upon the fields, to flow back through rivers.

Little Things that Count.

In every line of business, no matter whether conducted upon a large or small scale, it is the little things that count. The little expenses, the little wastes, the little economies, are the ones that turn the balance of accounts, either for profit or loss, and it is these little things that need the closest attention. The larger, more important details of every business are carefully looked after; there is very little chance for neglect, carelessness or oversight. The workman who spoils a costly piece of machinery, or causes a loss of any considerable account, is held responsible, and is generally very careful in this respect, but in little things he is not as prompt in exercising care and economy, and these little things are looked upon as of no consequence, and as having no real value.

We have heard it asserted by a man who, beginning on barely nothing, succeeded in building up a large and profitable business, and retiring with a considerable fortune, when asked how he had managed, what was the secret of his success, he replied, by saving what other people wasted, looking after the little things and seeing that not a thing was thrown away or cast aside as too small or insignificant to be of any value. A few cents here and a few there make up quite a sum in the course of a year, and it is by paying careful attention to the little details, by looking after the cents, that I have made my dollars.

There is a great deal more in this than most people would be willing to admit. They are in too much of a hurry to make dollars to look out for the cents.

A poor and incompetent or disinterested workman is not only a poor man to employ because he is this, but because he is wasteful and careless about small things. Take some of our very large manufactories, where hundreds of employes are engaged, and, unless the most watchful care is exercised, the amount of waste that is lost would go far toward paying running expenses.

In these times of close competition, when it becomes an absolute necessity that every possible item be carefully turned to account, the exercise of economy in small things is being more rigidly cultivated. Profits at best are only small, and these are made considerably less by the wastefulness of careless and unthoughtful men.

Nor is it alone in the factory or workshop where the necessity of looking after these little things makes itself apparent. The workingman of to-day, with his wages scarcely sufficient to provide for the comforts and necessities of life, has the most need to practice economy in small things, and it is surprising to note what an amount of waste is made by those who have the most need to practice economy. A few cents here and a few there seem mere trifles, and are not regarded as of any particular consequence, or as having any material relation to the annual expenses, but if a careful account were kept for a single year, the result would be astonishing, and just here is where the difference lies between individuals and corporations. The latter have learned by a comparison of the strict accounts which are an absolute necessity with them, the lesson of economy in small things. Everything is put down and can be looked over and studied, and its effect upon the total noted, and this is a lesson which should be learned by individuals, and workingmen especially. By them, as a rule, no account of daily expenses, or even any expense, is kept. They receive their money, and it is spent. At the end of the year not one of them can tell where his money has gone, or for what purpose, whether he has made a profit from the time and labor expended, or not; and for this reason, as well as that he may see where and how he may economize and save something, even if only a small amount, the workman should keep a strict and careful account of daily expenditures and receipts.

Such a course would not only result beneficially to him personally, but would make him a more careful, painstaking and valuable employe. Carelessness at home or of one's personal interests breeds carelessness of others' interests, and there is nothing which an employer notices more quickly, and is more willing and ready to appreciate and reward, than the display of care and interest in the little details by a workman.

It cannot be expected that a man who is careless of his own welfare and interests will exercise any more care than he is obliged to do under the watchful eye of the foreman or proprietor, or care for those of his employer.

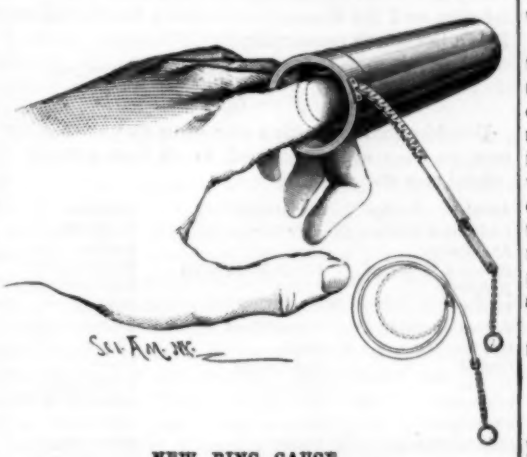
It is, then, all-important that every individual exercise this watchfulness of the small things in business and in private life. The employer must guard himself against loss by the carelessness and wastefulness of his employes. The employe should be equally vigilant in his own personal interests, and all should remember that it is the little things that count.—*Manufacturers' Gazette.*

THEY are making excellent wool out of the fiber of the fir-tree by means of electricity. The time is now come when the lamb may as well lie down with the lion.

NOVEL FINGER RING GAUGE.

The common method employed by jewelers for measuring the finger to be fitted with rings is to apply a number of independent rings to the finger until one is found of the required size. This operation, of course, occupies considerable time, and is not perfectly accurate.

We give an engraving of a new ring gauge recently patented by Messrs. Ethelbert Wareham and W. F. Doll, of Winnipeg, Canada. This gauge consists of a conical metal cap of convenient size to be held in the



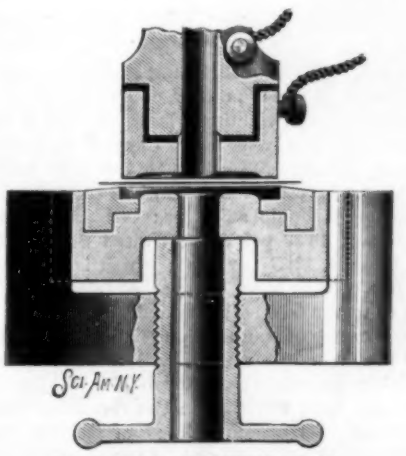
NEW RING GAUGE.

hand, and of larger diameter than the largest finger to be measured. In this cap is placed a string tape measure, with one of its ends attached to the interior of the cap, while the other end projects through a slot in the cap, and is provided at its extremity with a chain and ring. The tape measure is provided on its outer surface with a scale, and with notches in its edge corresponding with the graduations of the scale. To the surface of the case at the side of the slot is attached a stop plate, which is received in the notches of the tape measure.

The finger to be measured is inserted in the case, as shown in the larger view of the engraving, and the tape is drawn out until its inner portion encircles the finger, when the graduations appearing opposite the stop plate will indicate the number of the ring required.

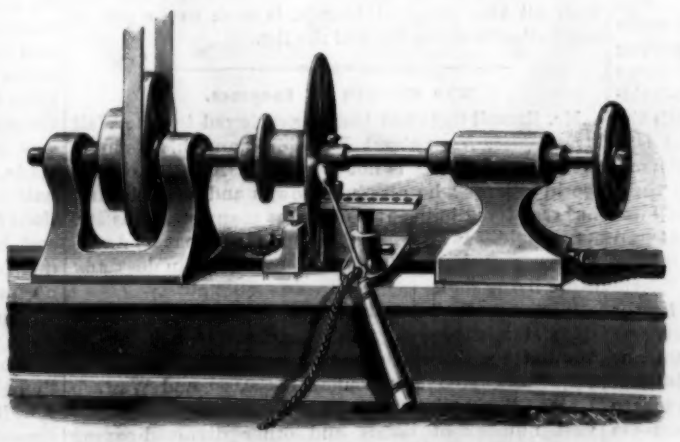
IMPROVEMENT IN THE ART OF SHAPING SHEET METAL.

In spinning or stamping sheet metal, most metals require frequent annealing, while it is necessary to work some of them, such as zinc, while warm. To obviate



ELECTRICAL DRAWING DIES.

the necessity of frequently heating the work, Mr. Mark W. Dewey, of Syracuse, New York, has devised improvements by means of which heat can be locally applied. The invention is designed to be adapted to metal-spinning lathes, to drawing dies, and to other sheet metal working machines. The source of heat is a current of electricity, which must of necessity have a large volume and low electromotive force.



DEWEY'S IMPROVEMENT IN METAL SPINNING.

In the case of a spinning lathe, the current is applied to the work through the mandrel, in case it is of conductive material, or if it is of wood or other non-conductor, it is applied through a brush which touches the back of the plate. A conductor also extends to the spinning tool, so that the current must pass into the plate at the point of the tool. The resistance of the contact and of the material of the plate is sufficient to produce the heat necessary to anneal the metal, so that the process of spinning can be carried forward without interruption until the work is completed.

In the case of the drawing dies, the lower portion of the upper die is insulated from the other part, and connected with an electrical generator, so that when the die touches the metal sheet, it forms an electrical connection. The punch by means of which the drawing is done passes through the upper portion of the die, which is connected electrically with the other conductor of the generator, so that the current flows through the lower part of the die, through the plate, through the punch and back to the generator, thus producing at the point of contact between the punch and the plate the heat necessary for annealing.

This invention is particularly adapted to the manufacture of cartridge shells and the drawing of tubes.

The Atmosphere of the Sun.

Mr. J. Janssen, on the 22d of September, gave the French Academy of Sciences an interesting account of his recent excursion to Mont Blanc, the object of which was to solve the much controverted question of the presence of oxygen in the solar atmosphere. This question is one of the most important that celestial physics can propose, by reason of the immense role that oxygen plays in geological and chemical phenomena, and especially in those upon which depends life in all its forms. Therefore, much attention has been paid to it for a long time, but, as is well known, it has always remained undecided.

Summing up the spectroscopic observations made during this ascension to the summit of Mont Blanc, Mr. Janssen states that they complete and confirm those that he began two years ago at the station of the Grands Mulets at an altitude of 3,050 meters, and that these observations as a whole, that is to say, those made between the Eiffel Tower and Meudon, those of Mr. De la Baume Plurinel at Candia, those of the laboratory, and finally those of this year on Mont Blanc, unite in leading to the conclusion that there is no oxygen in the gaseous solar envelopes that surmount the photosphere, at least no oxygen with a constitution that permits it to exert upon light the phenomena of absorption that it produces in our atmosphere and which are shown in the solar spectrum by the system of rays and bands that are known to us. Mr. Janssen considers that this is a definitely determined fact, whence may be drawn certain conclusions touching the constitution of the solar atmosphere.

It is certain that if oxygen existed simultaneously with hydrogen in the external envelopes of the sun and accompanied it to the remote limits where we observe it, that is to say, to the coronal atmosphere, the ultimate cooling (in a period of time that we cannot yet estimate, but which it would seem must inevitably occur when our great central furnace begins to exhaust the immense reserves of force that are still at its disposal) would have the effect, if the oxygen and hydrogen were in presence, of bringing about their combination. Aqueous vapor would then form in these gaseous envelopes, and the presence of this (from what we know of its properties) would have the effect of offering quite an obstacle to the sun's radiations, chiefly its heat radiations. Thus, the reduction of the solar radiation would be further accelerated by the formation of such vapor.

Volcanic Silver.

The existence of silver in volcanic ashes is of rare occurrence. Only in two cases have argentiferous ashes been met with. The first sample was obtained during an eruption of Cotopaxi, in July, 1885, in the ashes of which Mr. J. W. Malet proved the existence of one part of silver in 83,000 parts of ashes. In the following year the same investigator was able to add a second instance. In January, 1886, a violent eruption of Tunguragua, in the Andes of Ecuador, between 50 and 55 miles from Cotopaxi, took place, the eruption continuing at longer or shorter intervals up to November of the same year.

The ashes thrown up by this volcano, which had been at rest for over a century, contained silver to the extent of one part in 107,300 parts of ashes. This appears, at first sight, to be only a very small percentage of the metal. But when it is considered what enormous quantities of ashes are erupted, and what a vast extent of area they cover after an eruption, the quantity of the silver thrown up with them must be considerable.

Antiquity of the Carpenter's Plane.

A very interesting discovery has been made at the Roman city of Silchester. The excavators came across a dry well, which on being explored proved quite a little museum of antiquities. Some 15 feet down, a *Times* correspondent says, the diggers found an urn-shaped pottery vase, about a foot in length, quite intact, and, curiously enough, protected by lumps of chalk built around it. The vase, which probably originally contained some precious substance, was, however, quite empty. Above it were deposited a great number of iron implements, most of which were in a wonderful state of preservation. They seem to have been the tools of a carpenter and a coppersmith or silversmith, with some miscellaneous objects of blacksmith's work thrown in. The principal specimen is a carpenter's plane of quite modern type, although unquestionably more than 1,500 years old, three or four axes retaining their fine cutting edges and still quite serviceable, a number of chisels and gouges of all shapes and sizes, hammers, adzes, saws, files, etc. In the smith's department may be specified a brazier for burning charcoal, quite complete, two or three anvils of different sizes and shapes, a fine pair of tongs adapted for lifting crucibles, a curious tripod candelabrum lamp, or candlestick, and several other curious objects the precise uses of which have not yet been determined. In addition there are several large bars of iron, a couple of plowshares, and a broken sword. Probably more will be found deeper down in the well. This is undoubtedly the most important find at Silchester since the discovery of the bronze Roman eagle, now at Strathfieldsaye, some years ago.

Baking Powders Once More.

Many combinations of chemicals have been proposed and tried for baking powders, but the general consensus of housekeepers, as well as of scientific authorities, has settled upon a mixture of sodium bicarbonate (baking soda) with potassium bitartrate (cream of tartar).

Were the above mixture of chemicals allowed to stand, it would soon deteriorate. To prevent this it is mixed with an inert substance which isolates to some extent the particles of the mixture, so as to confer lasting powers upon it. This substance is usually flour or powdered starch, and is termed "filling." Some filling is necessary. About 10 per cent is the least that can be used by the most careful manufacturer, and all over 18 per cent should be considered an adulterant, harmless, indeed, but nevertheless an imposition on the consumer.

Twenty-one baking powders are cited in the United States Department of Agriculture report on foods and food adulterants, Washington, 1889, as exceeding this amount. The amount of starch varies from 24·57 to 52·29 per cent, which goes to show how much starch is bought and paid for at the price of baking powder. All but two of these contain ammonia or alum, or both, and are in the list of powders given below.

A more important point, however, is to know what baking powders are adulterated with alum or ammonia, as the continued use of such powders, according to many authorities, injures the health.

The use of alum in baking powder has been prohibited in England, France and Germany, and a law has recently been passed in Minnesota requiring manufacturers using alum to publish on the label, "This baking powder contains alum;" and the Canadian government report says (page 27): "The residues left in the bread after use of an alum powder are sulphate of ammonia, sulphate of soda, and alumina. The last named is an earthy substance quite insoluble and therefore indigestible." (Page 31) "Alum is entirely objectionable as a substitute for cream of tartar, and ought not to be allowed a place in any well appointed bakery."

The insidious effects of ammonia as an adulterant in baking powders are not so well known, but Bartholow sums up the evidence against ammonia as follows: "The long-continued use of ammonia impairs digestion by neutralizing the gastric juice. Increased waste of tissue is also one result of its administration, manifested by pallor, emaciation and feebleness." And the *Pacific Medical Journal*, commenting on the cause of dyspepsia, says (page 687): "This question regarding the effect of ammonia upon the human economy is one upon which authorities do not differ, and the individual experience of every physician is in accord with the assertion of authorities. The agent (ammonia) is a drug, not a food; an excrement, not a nutriment. The amount received by the system through these means, while not great at any particular time, and not sufficient to prove injurious, becomes both great and deleterious by being continuous. Physicians owe it to their patients and to the people generally to inform themselves regarding this matter, and without fear or favor unqualifiedly to condemn injurious preparations; and the various boards of health throughout the State, in dealing with the question of food adulterations, would do the people a great service to look well to the brands of baking powders containing ammonia and other injurious ingredients."

In the face of such testimony, quantities of ammonia are used, one company, it is estimated, using every year in the manufacture of their baking powder two hundred and fifty thousand (250,000) pounds. It is a common right of the people to know what food compounds contain. There is, however, no law to that effect at present, and for the protection of the public we have compiled a list of baking powders containing ammonia and alum, from five official reports, viz.: United States Department of Agriculture, Bulletin No. 13; Inland Revenue Department, Canada, Bulletin No. 10; Ohio Dairy and Food Commission, New Jersey Dairy Commission, and the Massachusetts State Board of Health. It is a list worth preserving.

AMMONIA AND ALUM BAKING POWDERS.

Compiled from Official Reports.

Powders marked with a star seem to have a general sale, as they are mentioned in at least two of the official reports.

American Gilt Edge	Forest City	Pearsons
*Atlantic & Pacific	Four Ace	Perfection
Aunt Sally	Gem	Peerless
Brooks & McGeorge	George Washington	Pride of Ottawa
Brunswick	Globe	Pride of Toronto
Buckeye	Gold	Princess
Burnett's Perfect	Golden Sheaf	Purity
Can't Be Beat	Grape	*Royal
Capitol	Great Eagle	Scioto
Carlton	*Henkel's	Silver Cream
Centennial	Higgins	Silver Queen
Challenge	Holyoke	Silver Spoon
Cook's Acme	Hygienic	*Silver Star
Cook's Best	International	Silver Thimble
Cook's Choice	James	Snowdrift
Cook's Favorite	Jersey	Sovereign
Cook's Finest	*Kenton	Springfield
Coral	Lincoln	Star
Cottage	London	State
Crown	Mason's	Standard
Crystal	Metropolitan	Sterling
Daisy	Miles	Sun Flower
*Davis O. K.	New Era	Superior German
Dixon's	Ocean Foam	Veteran
Dooley's	Ocean Wave	Vienna
Dry Yeast	Old Colony	Washington
Eclipse	One Spoon	Welcome
Empire	On Top	Wheeler's
Enterprise	Oriole	White Star
Eureka	Our Best	Windsor
Feather Weight	Our Own	Zipp's Grape Crystal
Fleur de Lis	*Patapsco	

In the U. S. report, the results of analyses by Prof. H. A. Weber, made for the Ohio Dairy and Food Commission, and by Prof. H. Bedinger Cornwall, of Princeton College, N. J., for the Dairy Commission of New Jersey, are cited, as well as those by Dr. H. W. Wiley, Chemist of the United States Department of Agriculture. This gives a peculiar value to the report, which of course contains a great deal which cannot be summarized here.

One prominent powder is reported by all authorities as free from anything that could be considered an adulterant. Cleveland's Baking Powder is reported as a pure cream of tartar powder, containing about 10 per cent of filling, and yielding a large amount of carbonic acid gas. On this latter factor depends its strength, or leavening power. According to the four authorities mentioned, Cleveland's powder gives the following percentage of carbonic acid gas: Ohio, 12·80 per cent; New Jersey, 13·57 per cent; United States, 12·58 per cent; Canada, 12·57 per cent; which is an average of 12·87 per cent, a high average, equaled by no other cream of tartar powder examined.

Its constancy of composition is also strongly testified to by the Canadian report. All things considered, it may fairly be said that Cleveland's Baking Powder makes the best showing in the reports of these four authorities. Its absolute freedom from anything in the nature of an adulterant cannot be too strongly emphasized. It contains, according to the official reports which we have quoted, no adulterant whatever, and by the different chemists is shown to possess a remarkably uniform leavening power.

This quality of uniformity is of importance. In adding a given proportion of baking powder to flour, it is essential to know that a definite amount of gas will be produced. Otherwise many spoiled products will result. The showing Cleveland's makes, compared with all the principal brands, is such as to put it emphatically at the head of the list.

The Growth of Incomes.

Mr. Russell Sage has been interviewed by the Wall street *Daily News* about Jay Gould and his fortune. He said: "There is not a man in America or the world at large who absolutely owns and controls, and has registered in his own name, as many stocks as Mr. Jay Gould. It is no exaggeration to say that he draws more revenue from his invested capital than does any other living soul.

"In order that some idea may be had of his wealth, it is simply necessary to take three of his stocks: Manhattan, of which he owns and has registered $10,000,000, Missouri Pacific $12,500,000, and Western Union $25,000,000. Of these three, independent of his vast number of bonds and other dividend-paying securities, he draws for dividends over $2,000,000 a year. His income from other sources, of course, amounts to four or five times as much.

"People do not appreciate what the amount of an income of a man like Mr. Gould means. It will be readily seen that he cannot commence to use for his own personal uses even a small part of the interest which the dividend money alone would yield. He must reinvest it, and he does reinvest it. When you consider that there are scores, and I might say hundreds, of people whose yearly rentals, dividends, interest on bonds, etc., amount to, well, from a half million to two million dollars a year, it will be readily seen that they have considerable surplus to put into new investments. The creation of securities which continually goes on indicates that there are plenty of people who are willing to put their money into them."

Two Cases of Lightning Stroke.

BY PROF. H. S. CARHART.

In the neighborhood where I lived when a boy, a barn, which I remember well, was struck by lightning a few weeks since and burned. This barn did not stand on elevated ground, but on the border of rather low meadow land, and was surrounded with hills, except on one side. The special point of interest attaching to the case is one touching the protection afforded by lightning rods, coupled with the additional fact that, notwithstanding the old adage, lightning does sometimes strike more than once in the same place.

Twenty years ago and more this particular barn was provided with an iron rod, which was carried down on glass insulators and into the ground at the end of the barn where the earth, a heavy clay soil, was always moist and generally wet. My brother, who lived there for several years and was familiar with the place, testifies that not infrequently after a heavy thunderstorm there was undoubted evidence that the rod had been struck, for the earth had been thrown away from the lower end of the rod to a depth of some six inches and for a considerable lateral extent. Just how often that occurred was not noted, but it was often enough to attract attention. My brother removed from there many years since, but I heard the same report recently from a reliable old gentleman who has lived there nearly all his life.

For some time the rod has been out of repair, and it was finally removed from the barn. How long since that occurred, I did not learn. But recently the lightning apparently struck the weather vane and set fire to the barn. While the rod remained on the barn, the evidence is strong that it carried more than one lightning discharge safely to earth.

Another case was related to me. A few miles from the barn referred to was a church, which at one time had a rod running from the spire to the ground. But in the course of time the rod became separated somewhere on the roof and was left out of repair, probably because of insufficient faith in lightning rods. This lack of faith was somewhat dearly paid for, because lightning struck the rod, was carried safely down as far as the attached end; thence downward, it expended its energy on the building. It was not fired, but damage to the extent of several hundred dollars was done. The cases above, in which the lightning discharge followed the rod, may have been instances of Prof. Lodge's "steady strain," and not of the "impulsive rush" variety. But both go to show the usefulness of rods properly erected and in repair. Both accidents happened only after carelessness allowed the rods to fall into what was doubtless thought to be "innocuous desuetude."—*Western Electrician.*

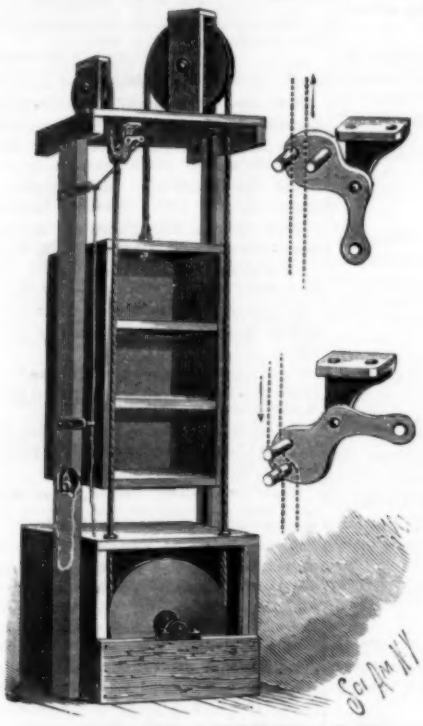
Hope for Bald Heads.

Dr. P. A. Morrow, at a meeting of the N. Y. Academy of Medicine, said he had had no personal experience with Thiersch's method. He had used grafts very much thicker than those mentioned in the paper—grafts which included not only the entire thickness of the derma, but also subcutaneous tissue beneath. He had been led to do this in the case of a man who had become somewhat hypochondriac because of a scar on the scalp, which in later years became exposed from scarcity of hair. He first took grafts from the patient's own scalp, on the opposite side, by means of the cutaneous punch, and immediately transplanted them into holes of the same size made by the same instrument in the scar tissue. Very much to his gratification, union was perfect within a week. Four grafts were first made, and he waited several weeks to see whether the hair would grow. It did. He then made transplantations from another patient's scalp, and these also grew and bore hair luxuriantly. The grafts were fully a quarter of an inch thick. There was no suppuration, no untoward result. He had employed the same method in one or two cases of epithelioma, and, while there was no indication of breaking down, there had not been sufficient time to justify conclusions. He thought the method had a wider field of application. For instance, it might be adopted in lupus, and in removing moles, warts, and other facial blemishes.—*Med. Record.*

AN IMPROVED DUMBWAITER.

We give an engraving of a dumbwaiter recently patented by Mr. Anton Larsen, of 413 and 415 East Twenty-fourth Street, New York City. This apparatus is superior to others in point of simplicity, positiveness of action, and manageability.

The waiter is adapted to suitable guides, which extend through the several floors, and is suspended by a rope attached to the top of the waiter, passing over a pulley at the top of the waiter shaft, thence downward



LARSEN'S DUMBWAITER.

around a pulley at the lower end of the waiter shaft, thence upward over a pulley at the top of the waiter shaft, thence downward into a tube, where it is attached to a counterbalance weight. The rope, in passing upward to the last named pulley, goes through the brake, which is shown in detail in the two smaller figures.

The brake consists of an angled lever pivoted to an arm extending downward from the cover of the waiter shaft. One arm of the weighted lever is furnished with a pair of studs, which extend on opposite sides of the rope. The other arm of the lever is furnished with an eye, in which is inserted a small rope, by means of which the brake is operated. The arm of the lever which is provided with the studs is heavier than the other arm, and tends to engage the rope, as shown in the lower figure, whenever the lever is released, and when the rope is engaged in this way it is locked, and the waiter is prevented from moving.

This is a very simple but effective device for preventing the waiter from moving accidentally, and as that portion of the rope by which the waiter is operated moves in the same direction as the waiter, the brake will be automatically applied when the waiter descends, unless the angled lever is tilted by the operator by means of the rope. Wooden deadeyes are provided to prevent the rope from making a noise while it passes through the framework.

NEW SOLDERING MACHINE.

The engraving represents a new soldering machine for soldering sheet metal can bodies. This machine is provided with a device for bending in the ends of the can body at the seam, as shown in the detached view, preparatory to passing them through the machine.

The machine has an intermittent feed motion, which takes the can body from the horn at the front of the machine, carries the body forward to the bending dies, where the ends of the body at the seam are curved up as shown. The next forward movement of the body carries it through the fluxing device, which causes the seam to touch the flux, while the flux is prevented from entering the can by the turned-up ends. The next forward movement carries the can body through the soldering device, which closes up the seam with solder. Another movement carries the can body across the wiper, which removes the superfluous solder. The next movement carries the can body between a pair of dies, which straighten the body and restore it to its original form. Another movement carries the can body out of the machine, when it is ready for further manipulation. The several movements of the parts of the machine are effected by an ingenious arrangement of cams and gearing, and the whole is driven by any suitable power.

By means of this improved machine the solder is applied to the seam, and is prevented from entering the inside of the can body during the process of soldering. In this manner the spoiling or poisoning of the contents of the finished can is avoided, and, furthermore, a considerable saving in solder is effected.

Further information regarding this invention may be obtained by addressing the Jensen Can Filling Co., Astoria, Oregon.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Eastern District of Pennsylvania.

WRIGHT *v.* POSTEL.

BUTLER, *J.:*

Letters patent No. 363,936, granted to Charles A. Wright, for improvement in card-gilding machines, declared invalid, said Wright being held not to be the first inventor.

Where, in a suit for infringement, it appeared that the application on which the patent in suit was granted was filed January, 1887, and that some months previous thereto the defendant had devised and constructed the machine complained of as an infringement, and that in the winter of 1883–84 the plaintiff had described it to his solicitor, and that in 1886 he repeated the description more fully, and that he did not intend at either date to reduce the invention to practice, his only concern being to protect himself in the construction and sale of the machine made under an earlier patent, and did not ever intend to apply for a patent at all unless it should seem necessary as a means for preventing others from making these machines, and that at the time of applying for patent he had not embodied his invention in a machine for practical use, and it further appeared that at the time of his first conversation with the solicitor he was as well prepared to reduce his invention to practice and apply for a patent as he was at the date of the second, and that any competent mechanic accustomed to such work could have constructed the machine from the first description almost, if not quite, as readily as from the second; *held* that the plaintiff has failed in diligence.

It is the duty of inventors to use reasonable diligence in reducing their conceptions to practice and applying for patents when desired, and they cannot neglect it without danger to their rights.

The claims of letters patent No. 290,303, granted to Charles A. Wright, for machine for gilding cards, strictly construed, in view of the state of the art, and confined to the particular character of machine described and manufactured under it, and when thus construed the defendant declared not to infringe.

U. S. Circuit Court,—District of Maine.

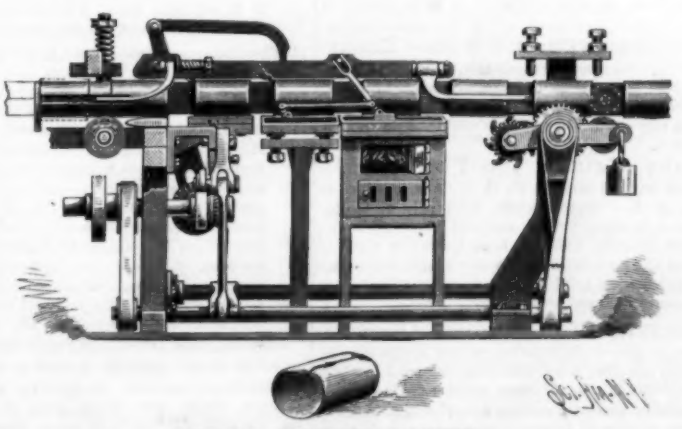
ASHE *v.* MUTUAL LASTING COMPANY *et al.*

COLT, *J.:*

Suit was brought under Revised Statutes of the United States, section 4,915, to determine whether A. or G. and C. were the inventors of a machine for which a patent was granted to G. and C., claiming, "in a tack strip heading machine, the combination of a support for the tack strip, consisting of a disk having peripheral teeth to engage between the shanks of the strip, a clamping jaw, and a header." The evidence showed that A. was the first to suggest the use of a wheel having teeth to engage between the shanks of the strip, but that the wheel was to have a positive movement, which was found to work imperfectly, while in the perfected machine of G. and C. the strip is not fed by the positive movement of the wheel, but the wheel is moved by the strip. *Held*, that A.'s claim to be the inventor of the complete machine is not sustained, and his bill will be dismissed.

American Locomotives in the Holy Land.

United States Consul Henry Gillman, at Jerusalem,



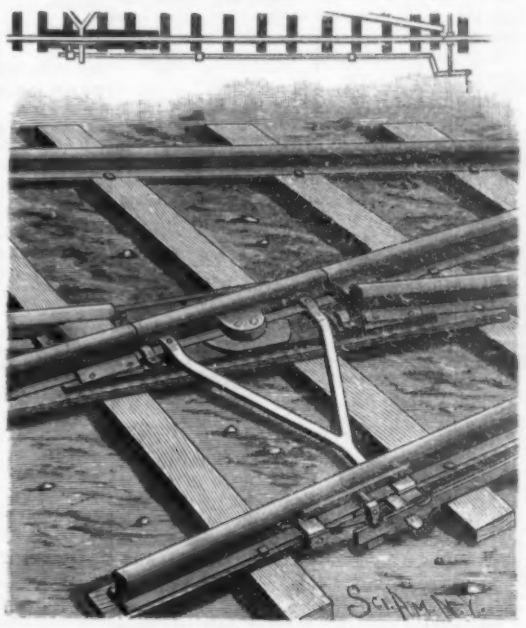
JENSEN'S SOLDERING MACHINE.

reports to the Department of State, under date of September 22, that three American locomotives made in Philadelphia, and intended for the new railway from Jerusalem to Jaffa, have arrived at Jaffa. The consul says it must interest American citizens to know that the first locomotives ever used in this ancient land were made in the new world.

NEW RAILROAD FROG.

The disagreeable jar and the noise produced by the passage of the car wheels over a railroad frog is well known to every one familiar with railroad travel, and the railway officials know only too well the amount of wear and tear caused by the use of the ordinary frog, but until lately no efficient substitute for this frog has been devised.

Mr. James Baird, of Chignecto Mines, Nova Scotia, Canada, has recently invented and patented a railroad frog over which locomotives and cars may pass as smoothly as upon a continuous track. In this invention, which is illustrated by the annexed engraving, at the point of intersection of the inner rails of the two



BAIRD'S IMPROVED RAILROAD FROG.

tracks the rails are removed, and a pivoted track section or frog is placed, to which is attached a forked lever for turning it on its pivot so as to cause it to coincide with either of the track rails.

The forked lever extends underneath the outer rail and is connected with a rod which extends to an angled switch lever, so that the frog is made to move simultaneously with the switch rails. A stop is provided for holding the frog-operating rod in one of the two positions in which it may be placed. The pivoted rail section or frog is supported by a heavy metallic plate resting upon two or more ties, and the ends of the converging rails adjoining the frog are held in proper relation to each other by wedge-shaped distance pieces. The details of the frog and switch operating rods and levers are shown in the smaller view of the engraving.

The Diamond.

The diamond has been so long regarded as a natural crystalline form of carbon that one remembers with surprise that this assumption rests on such slender scientific support as the similarity of atomic weight, and the property of its gaseous combustion product to cause a precipitate in baryta or lime water. As it appeared not incompatible with this knowledge that the diamond and carbon might bear the same relation to each other as nickel and cobalt, Professor Victor Meyer has suggested the further investigation of the subject. In order to obtain a derivative whose preparation entailed no loss of material and yet admitted of easy determination of its physical constants, Herr Krause led the product of combustion in oxygen gas over red-hot copper oxide and then into ammonia water, from which solution he made the neutral sodium salt. This salt was found to correspond to the chemically pure carbonate in its crystalline form, water of crystallization, solubility in water, melting point, and electrical conductive power, so that there can remain no doubt as to the identity of the two substances.

The Phonograph Forestalled.

The sea serpent being dead, and the big gooseberry smashed, what are called forecasts of the phonograph are turning up. One even older than that of Cyrano de Bergerac has been found by Lieut.-Col. A. De Rochas in the April number of the *Courrier Véritable*, a small monthly organ published in 1632. "Captain Vosterlich," it reads, "has returned from a voyage in Australasia. He reports having passed by a strait below that of Magellan; he landed in a country where nature has furnished men with certain sponges which retain sounds as other sponges do liquors. So that when they wish to ask something or confer at a distance they speak into one of the sponges and send it to their friends, who, having received it, press it gently and make the words come out."

RECENTLY PATENTED INVENTIONS.

Engineering.

LIGHT HOUSE. — James Andrews and Gustav Lindenthal, Allegheny, Pa. This invention is applicable to light houses and other analogous structures, its special feature consisting in forming part of the foundation and superstructure integrally of a single tube or shaft, rendering the structure better able to withstand the pressure of the wind and impact of the waves than the light houses which are bolted to their foundations.

Railway Appliances.

CAR COUPLING. — James F. Deischer, Lancaster, Ill. An arm is pivoted on the drawhead, and a block pivotally connected with the arm is held to slide, serving to disengage the arm from the coupling link and raise the latter out of place in the drawhead in uncoupling the cars, the device permitting automatic coupling and the uncoupling of cars without the operator going between them.

PNEUMATIC RAILWAY SYSTEM. — George W. Kink, Washington, D. C. This invention covers a novel means of connection between an air tube along the line of the track and the motor on the car body, whereby a continuous flow of air from the tube to the motor will be maintained, the operation of the connection being positive, without undue friction, and yet maintaining air-tight joints.

RAIL CHAIN AND SUPPORT. — Curtis H. Showalter, Brookville, Pa. This is a device especially adapted for use at curves, to prevent spreading of the rails at such places, and consists of a series of combined chairs and supports for the outer rails, capable of slightly rocking movement, and serving to force the outer rail inward as the train passes over it.

Electrical.

INSULATOR. — Fidel Miro, Cienfuegos, Cuba. This is a device for the support of all kinds of wires, but especially those carrying high tension current, and is designed to support the wire so long as it is entire, but to release it as soon as it is broken and to automatically make connection with an adjoining wire.

WATER ALARM. — Francis M. Ashton, Lima, Ohio. This is a device adapted to sound an alarm when the water in a boiler or other receptacle rises or falls above or below certain limits, the points at which it becomes operative being easily changed, the device embodying levers connected with float rods, and adapted to make and break an electrical circuit.

Mechanical.

NUT LOCK. — Ithamar C. Hawes, New Milford, Conn. In connection with a bolt having transverse grooves across its threaded end, a nut is used having recesses in one face adapted to register with the grooves, the recesses being under-cut, whereby a flat key inserted in the grooves and recesses will prevent the turning of the nut, the device being especially designed for use with vehicles and agricultural implements.

SAW SET. — James Johnstone, New York City. By this device two contiguous saw teeth of any size and either fine or coarse may be set at one operation. One of the anvils therein is beveled at different degrees of slant on opposite sides and may be readily adjusted to bring any one of its beveled faces into position to suit different degrees of set to be given to the teeth.

STONE POLISHING MACHINE.—George B. McLean, Montpelier, and Othelo W. Lewis, Barre, Vt. This machine is designed to polish a greater area than prior constructions of its class, the polishing wheel frame supported by the main shaft being formed of folding sections. These sections and the polishing wheel are independently adjustable vertically, and means are also provided for relieving the main shaft from undue strain and for securing its proper centering should it become worn.

TYPEWRITING MACHINE.—Edward F. Youngs, West Camp, N. Y. This typewriter, in which upper and lower case and special type characters may be used at will, is capable of rapid manipulation by one hand of the operator, is comparatively noiseless in action, and gives an unobstructed view of the characters as they are made, thus permitting of the detection of errors and the verification of the work as it proceeds.

Agricultural.

COMBINED COTTON CHOPPER AND CULTIVATOR.—Thomas E. Anderson, Memphis, Tenn. On the under side of the frame of this implement are secured two converging beams carrying scrapers at their forward ends and transversely aligning harrow teeth adjustable vertically; and on the under side of the rear end bar of the frame are secured cultivator blades of the "elk's foot" pattern. On a shaft ranging longitudinally of the frame, radial arms are adjustably mounted carrying hoe blades or cutters, the shaft being operated by gearing from the rear wheels.

CORN HARVESTER AND HUSKER. — Leonard G. Youngs and Reuben Richardson, Grant Park, Ill. This device comprises a wheeled frame for traversing the field and carrying spirally and longitudinally grooved rolls for grasping the corn husks, an elevator for carrying away the husks, mechanisms for grasping the stalks and directing them to the rolls, a stationary bar against which the stalks strike and are released from the husks to fall into a chute leading to a wagon, and suitable operating mechanism, whereby a great saving of time and labor is attained.

HARROW.—Marion M. Grimes, County Line, Tenn. This harrow is formed in two sections, and may be worked both ways, as the teeth have a proper cutting edge either way; one section may be folded upon the other when a light draught is desired or the sections may be detached and used separately.

SACK FILLER AND SCOOP.—Walter H. Robinson, Hickson, North Dakota. This device is intended chiefly for use in filling sacks or bags with grain, but is capable of a variety of uses. It does away with the necessity of holding the sack with one hand and manipulating a scoop with the other, as it may be inserted in the mouth of the sack and the grain be scooped and at once passed into the sack, thus saving much time and labor.

Miscellaneous.

LETTER BOX AND GATE POST. — Richard Groom, Jr., Pueblo, Col. This invention provides a post having a box hinged in its upper end which when closed fits into the upper hollow portion of the post, and when desired may be swung outward to facilitate the ready removal of the letters and papers therein.

STEP LADDER. — John W. Hester, Brooklyn, N. Y. Combined with slotted side bar and legs pivotally connected to the bars are rods pivoted to the legs and having headed pins working in the slot of the side bars, a latch being pivoted to the side bars and adapted to engage the rods, with other novel features, designed to give great stability when the ladder is extended, and prevent its spreading.

DETACHABLE SPOUT AND CAN OPENER.—Daniel W. Green, New York City. This invention consists of a tube having one end provided with pointed members which may be easily driven into a can, and will cut therefrom a piece corresponding to the size of the tube, by means of which a sealed can may be easily opened, when the device will afford a convenient spout through which the liquid in the can may be poured.

SAFETY VALVE FOR KITCHEN BOILERS.—Peter J. and Cornelius F. Cunneen, New Rochelle, N. Y. This is a valve of cheap and stable construction, designed to be readily adjusted without special skill, and to the interior of which ready access may be had for examining or renewing its parts, to operate when the pressure in the boiler exceeds the pressure for which the valve is set, and allow the water to pass off until the normal pressure is restored.

GRATER FOR NUTMEGS, ETC. — Edwin C. Roraback, Saginaw, Mich. A horizontal cylinder is mounted upon a suitable frame and has a perforated bottom, a stationary grinding cylinder being mounted in one end of the horizontal cylinder, and a revolubic perforated disk mounted loosely therein so as to be longitudinally movable, with means for rotating the disk, by which articles to be grated may be rapidly reduced to a regulated degree of fineness.

LAMP SHADE SUPPORT. — Otto F. Wegener, Seattle, Washington. The fount or oil receptacle is provided with a trough-shaped peripheral rim at the point where it projects farthest from the center, this rim having an overhanging lip designed to receive a sliding foot bearing the shade, which is thus made adjustable around the lamp.

INDICATOR FOR BATH ROOMS, ETC.—Henry Tate, Verplanck, N. Y. This is a device for indicating to one outside when a bath room or other apartment for general use is occupied or vacant, the invention covering a novel construction and combination of parts, the device being operated by the movement of the bolt.

STIRRUP LEATHER STAY. — Jesse D. Padgitt, Dallas, Texas. This is a stay designed to cause the stirrup to hang in proper position for insertion of the rider's foot in mounting, and is U-shaped in cross section to receive the stirrup cross bar and provided with a loop on its convex side at the bottom for the stirrup leather or strap.

BOOT LEG SUPPORTER. — Harvey G. Boos, Doylestown, Pa. This is a bar, preferably made of sheet spring metal, carved for a portion of its length, and made of two sections pivoted together, adapted to be inserted in a side pocket of the boot leg, with its lower portion engaging the sole of the boot, to prevent the leg of the boot from sagging down or wrinkling at the ankle.

BARREL STAND. — George P. Pearson and John A. Foster, Attica, Ind. This invention provides simple means whereby barrels, etc., may be held on suitably arranged supports secured to a store counter, so that they may be readily swung from under the counter to admit of ready access thereto when desired, a peculiarly arranged cover being adapted to automatically fit over the barrel as it is pushed in place.

ADJUSTABLE CROZE.—William Kampfe and Joseph Nagengast, Bayonne, N. J. This is a cooper's tool designed to be instantly adjusted to fit various sizes of barrels, casks, and similar receptacles, and be very efficient in operation while simple in construction.

BABY WALKER AND PROTECTOR. — John S. Irvine, Charlotte, N. C. This is a shield or jacket made of *papier mache*, wood pulp, or similar material, its upper portion designed to snugly fit the body of the child, while its lower portion is flared or formed into cone shape, to extend outwardly from the feet and form a solid support, to assist the infant in learning to walk and protect it from injuries.

SPINNING TOP. — Arthur Alexandre, Paris, France. This invention relates to tops spun by a screw engaging a nut within the top, and provides the top with an attached sleeve, which not only serves as a handle by which the top may be held while withdrawing the screw to set the top in motion, but also permits the top being held in any position while spinning, and without retarding its motion.

MUSICAL SKIPPING ROPE HANDLE.—John N. Pringle, Belleville, Canada. This invention is an improvement in that class of devices in which the handle has a cogged or toothed wheel, and a bar swinging on the handle is connected with the end of the rope, and has a spring tongue for engaging the wheel, so that as the bar revolves, its spring tongue produces a rattling sound.

UMBRELLA. — John Bergesen, Brooklyn, N. Y. This is an improvement on a former patented invention of the same inventor, designed to provide means for preventing the ribs from spreading too far outward as the umbrella is opened, and for holding the cover away from the joints of ribs to prevent its entanglement therewith. The inventor is now perfecting machinery for the manufacture of the device, regarding which information may be obtained from F. C. Canture, 189 Broadway, New York City.

DEHORNING IMPLEMENT. — Robert A. Steele, Lawrence, Kansas. The object of this invention is to provide an implement for dehorning cattle in which the cutters are so connected that the animal's ears will not interfere with its operation.

PIPE TESTING GAUGE. — Francis M. Ashton, Lima, Ohio. This gauge, which is for testing gas pipes, contains a mercury chamber, the space surrounding which communicates with an air pump, the pipe and the mercury chamber. Any fall of mercury in the gauge glass, after pressure of air from the pump ceases, indicates a leak, whereupon ether is inserted in the gauge, air pressure is applied and the escaping ether denotes the location of the leak.

LITHOGRAPHIC STIPPLING. — Charles H. Gordon, East Orange, N. J. This invention is a novel method of producing lithographic stippling, by which a lithographer is enabled to accurately and rapidly secure effects similar to those attained by a stipple artist, slowly dot by dot, and also allowing of the production of a great variety of gradations of color, and insuring solidity of the work. The effect of a line engraving may also be produced. C. H. Gordon has taken out patents in this and foreign countries, the United States and Canadian patents being under the full control of the well known firm of lithographers, the Messrs. Knapp & Co., of New York City.

SURGICAL TENT OR DILATOR.—Thomas G. Knight, Rockville Center, N. Y. The subject matter of this patent is a tent or dilator for application to brood mares and other animals, and consists of a plug of expansible material having an elastic exterior layer. It is designed to absorb liquid matter in the affected parts.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

NOVEMBER NUMBER.—(No. 61.)

TABLE OF CONTENTS.

1. Plate in colors of a modern dwelling of pleasing design at West End, Chicago. J. De Howarth, architect, Chicago. Floor plans, perspective view, sheet of details, etc.
2. Elegant colored plate showing perspective view of a $1,400 cottage at Chicago. Two floor plans, sheet of details, etc. Architect J. M. Young.
3. Design for an entrance hall.
4. An attractive dwelling at Hollis, Long Island, erected at a cost of $6,000 complete. Perspective view and floor plans. Schwietzer & Diemer architects, New York.
5. A neat looking cottage at Humboldt Park, Chicago. Cost $3,300. Photographic perspective view and two floor plans.
6. A colonial house erected for Mr. C. A. Hutchings, at Montclair, N. J. Cost $5,000 complete. Floor plans and perspective elevation.
7. A Flemish cottage erected in Philia Park at Wayne Pa., at a cost of $5,800 complete. Perspective view and floor plans.
8. A house erected at Elm Station, Pa., at a cost of $5,200. Photographic perspective view and floor plans.
9. Perspective elevation and floor plans of a handsome cottage at South Orange, N. J. Charles B. Atwood, New York, architect. Cost $13,000 complete.
10. Engraving showing a block of economical brick houses erected at Philadelphia, Pa. Cost $2,000 each. J. M. Stiller, of Philadelphia, architect. Floor plans and perspective.
11. Perspective and floor plans of a Lake Side cottage at Minnetonka, Minn. Cost about $4,000. W. H. Dennis, architect, Minneapolis.
12. Miscellaneous contents: Some of the merits of the ARCHITECT AND BUILDERS EDITION of the SCIENTIFIC AMERICAN.—The air supply.—The Alhambra.—Decoration of entrance hall, illustrated.—Questions on construction.—The Henry Martin brick machine, illustrated. — Buckeye Portland cement. — A government contract for woodworking machinery.—Architects' and carpenters' transit, illustrated.—Improved dwelling houses, illustrated. — Dumb waiter and hand power elevators.—Improved double blind wiring machine, illustrated.—An improved boiler for power and heating, illustrated.—Resistance to fire of wood posts.—An improved door spring, illustrated.—An improved hot air furnace, illustrated.—The Taylor "old style" roofing tin.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

For Sale—New and second hand iron-working machinery. Prompt delivery. W. P. Davis, Rochester, N.Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

For best hoisting engine. J. S. Mundy, Newark, N. J.

Wanted—Descriptive price lists patent lime kilns. Address F. B. Pratt, Canton, Mississippi.

Flour emery a specialty. New process. No dust. All grit. The Tanite Co., Stroudsburg, Pa.

Belting.—A good lot of second hand belting for sale cheap. Samuel Roberts, 309 Pearl St., New York.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 155 machines in satisfactory use.

Power presses and dies. Also contractors for special machinery. T. R. & W. J. Baxendale, Rochester, N. Y.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

"How to Keep Boilers Clean." Send your address for free 96 p. book. Jas. C. Hotchkiss, 120 Liberty St., N. Y.

Billings' Double-acting Ratchet Drills. Drop Forgings. Bronze Forgings. Billings & Spencer Co., Hartford, Conn.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Rubber Belting, all sizes, 77½ per cent from regular list. All kinds of Rubber Goods at low prices. John W. Buckley, 156 South Street, New York.

Wanted to Purchase—Patents for cutting pliers and hand vises for telegraph uses. Address D. N., care Munn & Co., 361 Broadway, New York.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For low prices on Iron Pipe, Valves, Gates, Fittings, Iron and Brass Castings, and Plumbers' Supplies, write A. & W. S. Carr Co., 128 and 140 Centre St., New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Advertising for Profit. Trade journals a specialty. Mr. Western's system saves time and money. Ten years experience. Best of references. Manufacturers' Adv. Bureau, 111 Liberty Street, New York.

An experienced business man and engineer, experienced in steam and electrical matters and an expert in general mechanics, is open for an engagement as manager of the New York business of some manufacturing concern. My age is forty-two. Salary expected fair. Address Mr. Wood, care Scientific American office.

$250 for invention to utilize rise and fall of tides for at least six hours to extent of at least three horse power. $250 for an inexpensive device to denote hygienic condition of air in a room. Limit, April 1, 1891. For details and particulars address J. A. Woodson, President California Museum Association, Sacramento, Cal. Note—Inventors to retain all their rights.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

NEW BOOKS AND PUBLICATIONS.

STEEL SQUARES AND THEIR USES. By Fred. T. Hodgson. Fully illustrated. New York: The Industrial Publication Company. 1890. Pp. 80. Price $1.

This is nominally Part II. of Mr. Hodgson's well known work on the steel square. It is in reality complete in itself and is a supplement to the original volume. It describes the application of the square to carpentry, joinery, sheet metal work, cut stone and brick work. Although the subjects treated cover a wider field, the new book is as compact as the old, and should be in the hands of all workmen interested in laying out work by the steel square.

MICROBES AND THE MICROBE KILLER. By William Radam. New York. 1890. Pp. xiii, 369. Price $3.00.

The germ theory of diseases is treated and illustrated, quite profusely by the author of this work, whose claim is that its contents are unique, that the theory he sets forth is new and that the proofs of its truth are forceful. It will doubtless be of interest to scientists and physicians.

SUGAR ANALYSIS. By Ferdinand G. Wiechmann. New York: John Wiley & Sons. 1890. Pp. vii, 187. Price $2.50.

This very practical work is devoted mainly to the commercial analysis of sugar, including sampling, hydrometric work and polarization. Excellent tables of specific gravity, the determination of dextrose, determination of lævulose, etc., give it a standard and real value.

MINERAL SPRINGS AND HEALTH RESORTS OF CALIFORNIA. With a complete chemical analysis of every important mineral water in the world. A prize essay by Winslow Anderson, M. D. San Francisco: The Bancroft Company. 1890. Pp. xxx, 384. Price $1.50.

This work is a prize essay written under the auspices of the Medical Society of the State of California, and it contains a large amount of matter interesting to prospective California tourists. The analyses of the mineral waters give it special value. The illustrations are characteristic and bring out forcibly the features which they illustrate.

☞ Any of the above books may be purchased through this office. Send for new book catalogue just published.

Address MUNN & Co., 361 Broadway, New York.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2558) **W. H. asks where to get a book** on steam yacht hull building, both in wood and sheet metal. A. We can supply you with "Steam Yachts and Launches, Their Machinery and Management," by Kunhardt. Price $3. 2. Are iron hulls better than wood for fresh water? A. No. 3. Is steam cheaper than electricity for propelling a boat? A. Yes. 4. Which is the best propeller for speed—a three or four blade? A. Probably a three-blade propeller is better. 5. Is a five horse power engine too heavy for a 23 by 5 foot boat? If so, what is the proper size engine to drive said boat 12 to 14 miles per hour? A. A two horse power engine should be big enough. You cannot get such high speed. 6. What is the fastest time ever made in the United Sates by a 25 foot steam yacht? A. There is no reliable record. Anything over 10 miles an hour would be very fast.

(2559) **M. A. T. asks** (1) **how to transfer** photographs to glass and whether oil or water colors should be used. A. See full directions in SCIENTIFIC AMERICAN SUPPLEMENT, No. 657. 2. Will sas-afras used freely as a tea for a flesh reducer harm one in good health? A. Not unless used in excess. 3. What organ would it be likely to affect the most? A. Possibly the brain.

(2560) **I. E. asks: Is there any composition** which can be either melted by a gentle heat or by immersion in alcohol or turpentine sufficiently to allow of its being run into a mould and allowed to cool or evaporate, thus becoming solidified again, thereby answering the purpose desired? A. What is called pure gum rubber, which is lightly vulcanized, can be pressed hot into talc-coated moulds, and by a longer heating will, to a considerable extent, retain the shape. Otherwise for a temporary purpose printer's roll composition (see query 2427) might answer.

(2561) **T. B. C. asks: Can you give in** your correspondent's column a receipt for cleaning paint off inside woodwork other than sandpapering? A. Burning is often used, the paint being scraped off as it melts under the flame of a blast lamp. Try washing with caustic soda or potash dissolved in water and thickened, if necessary, with lime or whiting.

(2562) **A Constant Reader asks: Please** tell me the composition of celluloid. A. It is in general terms an intimate mixture of nitrocellulose and camphor. It is described in answer to query 996. 2. Is that composition worked under patent? A. Yes. 3. How to unite it. A. A special cement is sold for the purpose. Possibly heat and pressure might answer your purpose.

(2563) **E. G. H. asks: 1. What causes** sal-ammoniac batteries to polarize? A. The depolarizer (binoxide of manganese) is a solid, and works very slowly. 2. Does in reality the positive brush of a dynamo have more to do than the negative? A. No. 3. Will a dynamo generate current in a vacuum? A. Yes; air has nothing to do with its action. 4. Can a chemist distinguish human blood from animal blood? A. Not with certainty.

(2564) **J. B. W. asks for a receipt for** making chamois skin (or leather) a conductor of electricity. A. Moisten with salt water, or thoroughly impregnate with fine graphite well rubbed in.

(2565) **K. W. asks: What is the composition** of smokeless gunpowder? A. A number of such have been invented. Sometimes the substitution of ammonium nitrate for potassium nitrate is the basis.

(2566) **L. A. W. asks: What is the composition** of a magnesium flash light powder without chlorate of potash?

A. Magnesium	40 per cent.
Permanganate of potassium	40 " "
Peroxide of barium	20 " "

(2567) **A. A. asks: 1. Has the soft iron** wire of the armature core of motor to be of one length? A. It is immaterial whether the soft iron wire of the armature is of a single piece or a number of pieces. 2. Is shellac varnish gum shellac dissolved in alcohol? A. Yes.

(2568) **M. P. asks: What decision was** taken at the meeting appointed by N. Y. Postmaster-General, in Washington, D.C., on October 1, about the letter box wanted for dwellings? A. No decision as yet. 2. What metal and what material are non-conductors of heat? A. No metal; quicklime and zirconia are among the best. 3. I have a device for ruled blue paper, very simple; how can I proceed to have some profit of it? A. Patent and advertise; we should not look for a large profit.

(2569) **J. A. C. writes: 1. I am using** water in my house from a boiling spring (cold), and it coats the tea kettle with a deposit of lime or something of that nature, and it is now almost half an inch thick, and I find it difficult to remove. How can I remove it and how keep it from gathering again if possible? A. You can purify it by adding to it some lime water. Determine by experiment how much is needed. This addition will produce a white precipitate and will carry down all the lime. The water must then be allowed to settle and clear. Do it a barrelful at a time. Once you determine the right amount to use per barrel, the principal work is done. 2. Do you consider such water unhealthy for one to drink? A. It is disputed. We incline to the belief that it is not necessarily injurious.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 28, 1890.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adding machine, J. H. Schnarrenberger 439,431
Advertising device, H. A. Snyder 439,329
Air brake, F. Lansberg 439,528
Air ship, navigable, P. W. Nahl 439,431
Alarm. See Burglar alarm. Fire alarm.
Ankylosis, apparatus for treatment of, J. E. Ruebsam 439,255
Anti-corrosive compounds, manufacturing, Heilbig & Berling 439,150
Ash pit gravity trap, E. T. Harris 439,146
Atmospheric engine, F. M. Widerman 439,422
Axle bearing, car W. J. Brewer 439,341
Axle box lid, car, W. S. F. Dillon 439,346
Axle lubricator, J. J. Stever 439,307
Axle lubricator, car, I. Barker 439,094
Baking powder or preparation, C. A. Catlin 439,267
Baling press, A. Wickey 439,535
Band cutter and feeder, R. E. Dorton 439,490
Band cutter and feeder, W. H. Izard 439,277
Band cutting and feeding mechanism, Dorton & Earle 439,489
Bar. See Cutter bar.
Barrel compressing machine, M. A. Hamilton 439,273
Barrel heading machine, W. Glader 439,241
Batteries, apparatus for transferring electric car, F. G. Corning 439,237
Batteries, porous cup for galvanic, C. A. Hussey 439,516
Battery. See Dry battery. Secondary battery. Secondary electric battery.
Battery plates, making storage, Morrison & Schmidt 439,416
Bearing, anti-friction, T. Tripp 439,283
Bed, folding, G. A. Garland 439,348
Bedstead, cabinet or folding, W. P. Tracy 439,444
Bedstead, folding, F. N. Potter 439,554
Bell, B. F. Vaughn 439,614
Belt, electric, J. F. Fields 439,347
Belt, outing, J. Hirshfeld 439,244
Belting, machine, G. F. Page 439,282
Bicycle, G. B. Durkee 439,129
Bicycle, G. Harriott 439,400
Bicycle, safety, G. B. Durkee 439,128
Board. See End board. Ironing board.
Board cutting machine, J. B. Burrell 439,321
Boiler. See Steam boiler.
Boiler feeder, automatic steam, B. Devlin 439,484
Boot or shoe nailing machine, T. Brining 439,216
Boot or shoe polishing machine, H. Pederson 439,179
Box. See Fare box. Journal box.
Brake. See Air brake. Hoisting machine brake.
Brick machine, R. W. Davies 439,222
Brick machine, W. Johnson 439,158
Broiler support, E. H. Abrens 439,569
Broom, J. H. Brinkop 439,470
Buckle, J. Reed 439,254
Buckle, D. L. Smith 439,436
Buckle, backband, C. A. Thurmond 439,443
Building, tornado-proof, D. Blanchard 439,373
Burglar alarm, J. J. Griffith 439,503
Burner. See Gas burner. Vapor burner.
Burner, A. F. Reinhold 439,560
Burring machine, F. G. Sargent 439,194
Butter purifying apparatus, A. F. Thayer 439,310
Buttonhole strips, making, Lyon & Lillingston 439,413
Button setting instrument, F. H. Richards 439,604
Cab door hanging device, C. Glencross 439,145
Camera. See Photographic camera.
Cant hook, F. S. Postal 439,553
Cant hook, J. Watson 439,315
Car and air brake coupling, W. H. Thresher 439,310
Car buffer, S. W. Ashmead 439,326
Car, cinder, C. Bochkoltz 439,465
Car coupling, J. Bond 439,319
Car coupling, E. M. Chesney 439,269
Car coupling, J. E. Clark 439,476
Car coupling, J. M. Hagerty 439,242
Car coupling, G. R. Lewis 439,410
Car coupling, J. F. Powell 439,424
Car coupling, S. H. Rathburn 439,558
Car coupling, B. Rowell 439,564
Car coupling, E. D. Vanier 439,448
Car, electric railway motor, E. Wagemann 439,584
Car heater, railway, W. C. Baker 439,287
Car heating apparatus, R. G. Chase 439,268
Car, railway, W. H. Jacoby 439,404
Car replacing and derailing device, S. F. Clouser 439,291
Car springs and means for storing air, means for regulating the elasticity of, H. M. Minton 439,302
Car switches, mechanism for operating street, W. A. Lee 439,254
Car, velocipede, J. J. Kirkham 439,523
Car wheel, H. F. Mann 439,358
Cars in train, power gearing for, A. R. Cavner 439,108
Cars, trolley pole for electric, Rowell & Galloupe 439,192
Cars, weighing attachment for, C. B. Wanamaker 439,215, 439,217
Carbonizing chamber, T. A. Edison 439,303
Carding engines, mechanism for stripping the traveling flats of, Dobson & Bromiley 439,126
Carding machines, automatic winding attachment for, McAfee & Loback 439,542
Carpet stretcher, F. H. Rundell 439,327
Carriage, child's, W. H. Newton 439,303
Carriage wheels, journal for, T. Clements 439,113
Carrier. See Gun carrier.
Cart, road, O. L. Muench 439,541
Cart, road, W. M. Ward 439,218
Case. See Pocket case. Sacramental case. Surgical case.
Casing splitter, B. Masseth 439,167
Caster, J. P. Nessle 439,546
Casting pipes and cylinders, mould for, Graham, Jr., & Graves 439,501
Chain, drive, C. H. Brampton 439,466
Chair. See Operating chair.
Checkrein hook, H. B. Madden 439,357
Chromatic pitch pipe, C. H. Congdon 439,115
Churn, H. W. Parsons 439,549
Cigar holder, J. H. Bowen 439,330
Cigar cutter and match safe, combined, T. Dalton 439,481
Cigar stump receptacle, W. F., Jr., & G. C. Smith 439,309
Cigarette machine, P. Vauselle 439,615
Clamp. See Sewing machine clamp.
Clasp. See Corset clasp.
Clasp, A. H. Bartley 439,288
Cleaner. See Horse cleaner. Window cleaner.
Clew thimbles, machine for making, J. T. Hambarto 439,350
Clip. See Whiffletree clip.
Clock bell, A. C. Sanford 439,193
Clothes pin, G. W. McCord 439,250
Clutch, electro-magnectic, C. H. Veeder 439,218
Clutch, friction, C. L. Hague 439,504
Coal, apparatus for removing piles of, J. M. Dodge 439,487
Coffee and preparing the same, dry extract of, H. Barotte 439,318
Coffee huller, and polisher, W. A. Diesseldorff 439,485
Coin setting T. F. Gaynor 439,139
Collar, breast, J. Sterett 439,208
Collar pad, horse, R. H. & J. Morrow 439,550
Comb. See Carry comb.
Corn, device for preparing green, L. M. Thompson 439,582
Corset clasp, Allen & Doolittle 439,291
Corset clasp, D. C. Cole 439,285
Cosmetic, A. Bosse 439,101
Cotton cupper, R. R. Pace 439,178
Cotton press, F. L. White 439,617
Coupling. See Car coupling. Car and air brake coupling. Thill coupling.
Crane, H. Aiken 439,364
Crane, traveling, C. Davy 439,483
Credit slip tablet, E. Seyfarth 439,434
Crusher. See Ore crusher.
Cuff holder, A. A. Lomont 439,299
Cultivator, E. E. Blackman 439,340
Cultivator, H. S. Brink 439,469
Cultivator, etc., strawberry, I. D. Carpenter 439,474
Cup. See Oil drip cup.
Curry comb, T. S. Sherman 439,435
Curtain stretcher, lace, J. Gilray 439,272
Cut-out, thermal, C. Goddard 439,396
Cutter. See Band cutter. Cigar cutter. Feed cutter. Pipe cutter. Thread cutter.
Cutter bar, L. W. Holland 439,276
Dam, A. Kirk 439,522
Dental heater, electro, L. A. Faught 439,238
Dental tool holder, C. M. Richmond 439,427
Dental work, preparing artificial gums for, D. E. Ruzz 439,305
Dentist's burring tool, A. W. Browne (r) 11,118
Digger. See Potato digger.
Disinfecting water closets, etc., apparatus for automatically, W. & G. Heywood 439,152
Display frame, adjustable, Standing & Hosmny 439,439
Door hanger roller, N. Clark 439,112
Door lock, sliding, C. E. Legg *et al* 439,163
Door spring, L. Burgert 439,236
Door stop, holder, and closer, J. W. Gosling 439,236
Draught attachment, vehicle, T. H. Brigg 439,468
Draught regulator, C. D. Howard 439,595
Dressmaker's fitting apparatus, J. L. Garcelon 439,500
Drill. See Rock drill.
Drill press, corner, F. Schoff 439,567
Dry battery, W. L. F. Hellesen 439,151
Drying apparatus, H. M. Sciple 439,328
Earring, Whittemore & Muller 439,457
Ear trumpet, F. M. Blodgett 439,099
Elastic circlet, G. H. Blakesley 439,575
Electric currents, automatic regulator for, W. Morrison 439,417
Electric elevator, F. B. Perkins 439,180
Electric lighting system, T. A. Edison, 439,389, 439,390, 439,392
Electric meter, W. H. Bristol 439,381
Electric motor, C. S. Bradley 439,102
Electric motor, synchronous alternating current, C. Zipernowsky *et al* 439,459
Electric switch, J. A. K. McGregor 439,632
Electric wires, junction box for, T. A. Edison 439,391
Electrodes for secondary batteries, method of and apparatus for preparing, C. D. P. Gibson 439,240
Elevator. See Electric elevator.
Elevator controlling device, S. E. Stokes 439,440
End board, vehicle, T. H. Brown 439,104
Engine. See Atmospheric engine. Gas engine Pumping engine.
Engine reversing gear, steam, D. A. Fraser 439,592
Engine starter, A. H. Wallis 439,449
Engine stop, Tushingham & Dubois 439,445
Evaporating and condensing water, apparatus for, H. Ferguson 439,132
Exhibiting device, J. Thome 439,210
Fare box, conductor's, T. W. Moore 439,600
Faucet, beer, J. B. Hogan 439,510
Feed cutter, E. W. Ross 439,429
Fence, W. W. Thomas 439,209
Fence, portable, J. W. Bruton 439,343
Fertilizer distributer, S. H. Everett 439,394
Fiber washing machine, F. G. Sargent 439,195
File, bill or paper, C. R. Hinkle 439,507
Filter, J. L. Bach 439,091
Fire alarm or fire and heat indicator, C. W. Summerskill 439,441
Fire escape, S. H. Roper 439,191
Fire escape, Zein & Reichelt 439,263
Fire escape lowering gear, Smith & Maynard 439,438
Fire extinguisher, H. E. Safford 439,565
Fire extinguisher, automatic, W. J. Fraser, 439,293, 439,294
Fireman's safety helmet, G. W. Barlan 439,034
Float, rotary, F. Deimel 439,124
Flood gate, Ivey & McMichael 439,517
Flue beader, boiler, B. B. Farris 439,496
Fly trap, H. S. McKee 439,545
Frame. See Display frame. Mosquisto bar frame. Seam pressing frame. Slate frame. Tent frame.
Fruit jar, C. J. Murphy 439,170
Fruit stoning apparatus, J. H. Hunter 439,155
Fuel, artificial, H. K. Flagler 439,394
Furnace and grate, J. Wodell 439,229
Gauge. See Plait gauge.
Game, J. S. Thompson 439,211
Game apparatus, W. A. Presbrey 439,425
Game counter, J. D. Ward 439,450
Gas, apparatus for generating illuminating water, J. D. Averell 439,461
Gas, apparatus for the manufacture of, H. White 439,435
Gas burner for bake ovens, J. W. Bates 439,572
Gas engine, H. K. Shanck 439,200
Gas engines, ignitor for, C. W. Baldwin 439,242
Gas regulator, J. Crawford 439,586
Gate. Flood gate.
Gate, T. J. Austin 439,460
Gate opening and closing attachment, F. W. Kimball 439,521
Gear cutting machine, R. Flanigan 439,134
Glass. See Reading glass.
Glassware, apparatus for the manufacture of, H. Schulze-Berge 439,196, 439,198
Glassware, manufacture of, H. Schulze-Berge 439,197
Glassware, manufacture of, C. Uflig 439,447
Grain scourer, P. Provost 439,555
Grate, S. Lancaskes 439,527
Grate bar, steam generating, W. H. Farris 439,131
Grinder, cutter, F. Holz 439,154
Grinding and polishing machine, A. Manecke 439,300
Grinding machine, A. H. Morton 439,418
Gun carrier, W. C. Richards 439,562
Gun charge indicator, G. K. Pheatt 439,551
Gun, machine, H. S. Maxim 439,248
Gun sight, R. J. Cushing 439,271
Gun, spring air, C. M. Joslin 439,246
Guns, auxiliary rifle barrel for, J. W. McCandless 439,543
Hame fastener, Granger & Johnson 439,502
Hammer, bush, K. E. Ware 439,219
Harmonica holder, G. A. Morgenthaler 439,415
Harvester, corn, G. H. Spaulding 439,203
Harvester, pea, J. H. Clement 439,344
Harvester, self-binding, F. W. Colby 439,282
Hat pouncing machine, J. T. Waring 439,314
Hay, apparatus for handling, T. Potter 439,326
Heat concentrator, P. M. Nixon 439,251
Heater. See Car heater. Dental heater. Water heater.
Hitching device, A. H. Wilson 439,285
Hoisting machine brake, A. Larsen 439,529
Holdback, vehicle, L. G. Allen 439,368
Holder. See Cuff holder. Dental tool holder. Harmonica holder. Lamp globe holder. Pencil holder. Spool holder. Tool holder. Umbrella or cane holder.
Hoof protector, L. E. Mellen 439,537
Hook. See Cant hook. Checkrein hook.
Hooping machine, barrel, F. Glankler 439,142
Horse cleaner, M. Renshaw 439,561
Horse detaching device, I. A. L. Lysgard 439,355
Horse hitcher, H. J. Baxter 439,463
Huller. See Coffee huller.
Ice machines, freezing box for, Rea, Jr., & Clark 439,559
Indicator. See Gun charge indicator. Measure indicator. Speed indicator.
Injector, W. Mack 439,356
Ink well covers, device for closing and opening, J. H. Hayden 439,148
Insect powder duster, J. M. Robinson 439,563
Ironing board, D. B. Washburn 439,452
Ironing machine, L. H. Watson 439,453, 439,454
Jar. See Fruit jar.
Joint. See Rail joint.
Journal box, anti-friction, T. Tripp 439,284
Knitting machines, work transferring mechanism, for, W. H. Appleton 439,571, 439,585
Knobs to their shanks, attaching, S. P. Cooley 439,120
Labeling bottles, etc., machine for, S. Cooper 439,270
Ladder, fireman's, J. H. Stupp 439,351
Lamp, T. Hipwell 439,593
Lamp, electric, A. Swan 439,363
Lamp globe holder, E. Atkins 439,090
Lamp, pocket, J. H. Farrel 439,578
Lamp socket, electric, J. O. Phillips 439,304
Lamp socket, incandescent, A. Swan 439,364, 439,365
Lamp socket, incandescent electric, A. Swan, 439,366, 439,367
Lamp standard, adjustable, O. Luetke 439,411
Lamps, repairing incandescent electric, C. Pauthonier 439,178
Lamps, etc., spring device for hanging, U. H. S. De Boer 439,100
Lathe attachment, A. Leek 439,531
Lathes, pipe and bolt threading attachment for, L. B. Curtis 439,122
Leaf turner, J. E. Pellow 439,550
Leather punching machine, S. H. Randall 439,603
Leather skiving machine, A. J. Tewksbury 439,208
Life-saving apparatus, T. W. Jeffries 439,157
Lock. See Door lock. Nut lock. Till lock.
Lock for satchels, trunks, etc., L. French 439,138
Locomotive, electric, F. W. Dean 439,345
Loom shedding mechanism, G. W. Stafford 439,204
Loom stop motion, J. J. Shanahan 439,605
Lubricator. See Axle lubricator. Shaft lubricator.
Mailing cages for boxes, W. H. Page 439,177
Manger, corner, G. Hutter 439,398
Match safe, pincushion, and trap, combined, H. Brandt 439,467
Measure indicator, liquid, T. Hipwell 439,508
Meats, curing, J. H. Greenstreet 439,144
Metal wheel and manufacturing the same, E. P. Lynch 439,417
Meter. See Electric meter.
Microscope, coin-controlled, A. W. & A. H. Roovers 439,189, 439,190
Milk cans, etc., safe for, R. H. Ricker 439,605
Milker, pnaumatic, J. T. Pomeroy 439,552
Mill. See Roller mill.
Mineral or metallic matters from the liquids in which they are suspended, process of and apparatus for the separation of finely divided, Newbery & Vantin 439,173
Moulding machine, sand, T. Scherf 439,430
Monkey wrench, F. L. Smith 439,201
Mosquito bar frame, Schwend & Wilson 439,256
Motion transmitter, electric, M. W. Dewey 439,577
Motive power and apparatus therefor, production of, C. Tellier 439,258
Motive power, means and apparatus for utilizing waste heat for producing, C. Tellier 439,259
Motor. See Electric motor.
Motor, F. J. Laun 439,162
Mower, J. Kaufmann 439,278
Mower, O. U. Perrin 439,253
Mower, lawn, D. P. McKinney 439,172
Musical instrument, stringed, I. L. Ximenes 439,270
Necktie fastener, H. H. Baker, Jr 439,371
Nozzle, exhaust, J. Fulmer 439,499
Numbering machines, governing device for, W. P. Uhlinger 439,446
Nut lock, J. & C. Kramer 439,279
Nut lock, Moseley & Benbon 439,540
Nut lock, C. D. Tisdale 439,212
Nuts of tire bolts, machine for manipulating the, J. R. Stunkard 439,257
Obstetrical apparatus, W. S. Hall 439,239
Oil drip cup, J. Simmons 439,568
Oil, harvesting, O. H. Shaw 439,007
Oil tank strainer, J. C. Dilworth 439,485
Oils, refining fat, R. Hunt 439,515
Ointment, F. D. Hall 439,581
Opera glass receptacle, coin-controlled, S. M. Dowst 439,127
Operating chair, R. R. Allen 439,088
Ordnance mounting, heavy, W. Anderson 439,570
Ore crusher, T. A. Blake 439,374
Organ, J. Gildersleeve 439,397
Organ action, M. Clark 439,111
Organ action, H. A. Vogel 439,616
Ornamenting plates, C. F. Joss 439,160
Pad. See Collar pad. Saddle pad. Truss pad.
Pantaloons fastener, H. H. Baker, Jr 439,372
Paper, blotting, G. L. Jaeger 439,405
Paper jogger, H. M. Aldrich 439,337
Paper, machine for applying adhesive material to strips of, C. F. Taylor 439,322
Paper making machines, couch roll for, Miller & Newman 439,538
Paper reel, Dewease & Lane 439,591
Paper stucco, composition for, O. Kiette 439,526
Pawl and ratchet mechanism, F. G. Tallerday, 439,612, 439,613
Pencil holder, E. Wehrli 439,220
Photographic camera, N. Crane 439,121
Photographic cameras, adjustable support for, C. S. Blake 439,098
Photographic instruments, focusing attachment for, F. B. Quimby 439,556
Photographs, background for, E. N. Howe 439,512
Piano action, B. Hartleb 439,147
Picking and carding machines, feeding mechanism for, H. Tindell 439,311
Pin. See Clothes pin.
Pipe cutter, C. M. & C. E. Kemp 439,407
Plait gauge, kilt, S. R. Camp 439,105
Plow attachment, A. B. De Bruce 439,575
Plow, combination, J. G. Walton 439,214
Plows, pulverizer attachment for, J. Creighton 439,587
Pocket case, T. P. Heinemann 439,401
Poke, horse neck, Huntoon & Perkins 439,596
Pole, vehicle, J. Hockman 439,154
Potato digger, A. Wilkin 439,223
Powder. See Baking powder.
Power. See Motive power.
Power transmitting device, S. K. White 439,316
Power transmitting mechanism, E. Chaffey 439,110
Press. See Baling press. Cotton press. Drill press.
Presses, gripper for job, G. W. Banks 439,462
Printing attachment for paper roll holders, G. C. Westervelt 439,221
Prining machine, platen, Moritt & Butterfield 439,281
Printing pictures on celluloid, P. H. Mandel 439,583
Printing presses, paper cutter for, J. L. Cox 439,479
Printing presses, sheet delivery apparatus for, W. Scott 439,306
Prints, making colored and other, H. Sandham 439,566
Prints or designs, transferring, W. H. Maxwell 439,536
Protector. See Hoof protector.
Pulley, G. W. Dryden 439,491
Pulley, A. S. Held 439,402
Pulley, clutch, J. C. Gibson 439,140
Pulley, split, G. T. Eames 439,493
Pump for gaseous fluids, compression, J. K. Kilbourn 439,520
Pumps, valve mechanism for double acting, L. Dahlstrom 439,480
Pumping engine, compound, Floyd & Morton 439,579
Purse, C. E. Albright 439,086
Pyroxyline compounds, manufacturing hollow articles from, J. D. Ward 439,451
Radiator, A. J. Brown *et al* 439,471
Rail joint, W. H. Connell ..... 439,116 to 439,119
Rail joint, C. Fisher 439,497
Railway, cable, W. J. Brewer 439,342
Railway conduit, electric, R. M. Hunter 439,597
Railway crossing, Kuhl & Lampe 439,280
Railway crossing, cable, J. P. Orr 439,547
Railway crossing, street, Quinn, Jr., & Angerer 439,426
Railway, electric, C. Richter 439,428
Railway, electric, L. Westerland 439,262
Railway rail splice, D. C. Winn 439,228
Railway spike, A. D. Kittle 439,524
Railway tie, H. D. Dasher 439,482
Railway tie, R. Osborn 439,174
Railway tie, E. H. & W. F. Walker 439,333
Railway track electrical annunciator, J. W. Lattig 439,409
Railway track fastening, C. A. Harvey 439,352
Reading glass, O. Huff 439,514
Reel. See Paper reel.
Reel and take-off apparatus, C. C. Clifford 439,114
Refrigerating and freezing apparatus, L. Perkins 439,181
Refrigerator, car, H. F. Hogan 439,509
Regulator. See Draught regulator. Gas regulator. Windmill regulator.
Return ball, W. E. P. French 439,396
Ring. See Earring.
Rock drill, Hobart & Ahearn 439,275
Roller. See Door hanger roller.
Roller mill, F. W. Howell 439,595
Ropes and cables, splicing, S. W. Verrill 439,583
Rotary engine, C. Melung 439,360
Rudder, hanging, F. J. Baxter 439,574
Rule, metal folding, W. Hohnstein 439,511
Rule, square, bevel, scribe gauge, spirit level, and dividers, combined, R. E. Woodruff 439,458
Ruling machine attachment, W. C. Smith 439,360
Sacramental case, J. J. Kennedy 439,519
Saddle pad, S. G. Jones 439,253
Sails, cringle clew for, E. Pinkham 439,422
Saw gin, D. McAnulty 439,601
Scales, automatic grain, J. H. Forsyth 439,135
Scales, weighing, C. B. Wanamaker 439,216
Scissors, reversible, J. T. Jefferson 439,323
Scourer. See Grain scourer.
Seal for vessels and means for opening the same, A. F. Fitz Gerald 439,133
Seam pressing frame, A. J. Wood 439,286
Seat. See Vehicle seat.
Seat back, adjustable, S. C. Houghton 439,403
Secondary battery, W. B. Hollingshead 439,594
Secondary battery, E. J. Mason 439,324
Secondary electric battery, J. F. Mehren 439,301
Seed, delinting cotton, Baxter & Macdougald 439,464
Sewing machine, J. Boppel 439,334, 439,379
Sewing machine, Moore & Reyfuss 439,168
Sewing machine, buttonhole, C. Chabot *et al* 439,109
Sewing machine, buttonhole, Mills & Moore 439,249
Sewing machine clamp, buttonhole, K. B. Allen 439,087
Sewing machine, mattress, E. N. Stephenson 439,205
Sewing machine tension device, J. Boppel 439,378
Shaft lubricator, E. Dawson 439,123
Shingle shaping machine, D. W. Williams 439,224
Signal, W. E. Dyre 439,492
Signaling system, recording, W. J. Fraser 439,295
Skate, R. K. Krause 439,240
Skiving machine, J. R. Scott 439,433
Slate frame, S. Marks 439,534
Sleigh knee, J. Applebaker 439,370
Snow plow, W. C. Hart 439,274
Soap cakes to chains, device for attaching, F. W. Ostrom 439,175
Soda, process of and apparatus for decomposing bicarbonate of, L. A. Staub 439,330
Sofa and bed combined, H. Plohr 439,196
Sole, inner, J. C. Blum 439,477
Spectacles, prismatic magnifying, P. J. Edmunds 439,130
Speed governor, Hoyle & Harrison 439,513
Speed indicator and ship's log, Thorne & Burr 439,442
Spike, safety, A. D. Kittle 439,525
Spinning machines, drawing mechanism for, B. L. Bailey 439,340

Spoke, machine for preparing, C. W. Cotton et al. 439,286
Spool holder, J. T. Foster 439,136
Spoon, M. L. Schoch 439,433
Spring. See Door spring.
Spring, machine for making upholsterer's, C. R. James 439,518
Sprocket wheel, D. M. Maxon 439,395
Stalk cutting attachment, J. Morrison 439,169
Stamp safe, L. Briggs 439,380
Stave planing and jointing machine, barrel, J. Anthon 439,089
Steam boiler, J. A. Caldwell 4.9,105
Steam boiler, Walworth & Nason 439,261
Steaming woolen fabrics or yarns, apparatus for, P. Heilmann-Ducommun 439,149
Stereopticon, L. D. McIntosh 439,431
Stereotype plate and base, G. W. Weaver 439,434
Stone saw, E. G. Kemper 439,247
Store service apparatus, W. H. H. Cram 439,387
Stovepipe cowl attachment, W. Emrich 439,494
Strainer, milk pail, F. A. Polka 439,185
Surgical case, pocket, F. A. Reichardt 439,187
Swing, J. P. Anvil 439,260
Switch. See Electric switch.
Switch worker, H. G. Hestmeyer 439,506
Table, Jonas & Mack 439,159
Table, easel, and writing, desk, combined, W. Reamy 439,196
Telegraphing, performator for automatic, F. D. Mack 439,164
Telephone, mechanical, H. M. Chamblin 439,475
Tenoning machine, E. F. Barnes 439,373
Tent frame, folding, S. W. Clement 439,264
Thermometer, metallic, L. Fromm 439,399
Thill coupling, O. L. Hall 439,505
Thill coupling, J. Hoff 439,245
Thill coupling, A. A. Story 439,039
Thread cutter, J. N. Dodge 439,488
Ticket, railway, J. Wilson 439,228, 439,227
Tie. See Railway tie.
Till lock, J. Outhet 439,548
Timepiece, self-setting, E. Muller 439,419
Tinner's mandrel, H. E. Plaine 439,558
Tobacco stick, R. T. Fitzgerald 439,498
Tongue support, J. K. Smith 439,202
Tongue, vehicle, D. W. Raidt 439,557
Tool, combination, G. Zitlow 439,146
Tool holder, E. F. Zengler 439,090
Toy, H. Heyder 439,297
Toy, swimming, L. Uebelacker 439,315
Trap. See Ash pit gravity trap. Fly trap.
Tricycle, W. L. Bryden 439,382
Trolley arm guide, A. F. Bardwell 439,062
Trolley heads, automatic wire finder for, G. S. Slocum 439,306
Trolley pole, L. Pfingst 439,182
Trough. See Watering trough.
Truck, logging, T. W. Garbutt 439,580
Truss, J. J. Felton 439,262
Truss pad, C. Gilson 439,141
Turbines, mechanism for operating gates of, W. O. Harris 439,324
Turnstiles, coin-operated lock for, H. Caspar 439,107
Twine, machine for making combined paper and fiber, F. R. Williams 439,225
Typewriting machine, G. H. Lasar 439,540
Typewriting machine, U. S. McCormack 439,544
Typewriting machine, F. Myers 4.9,171
Umbrella notches, apparatus for cutting, O. M. Smith 439,437
Umbrella or cane holder, J. B. Potts 439,423
Vacuum preserving apparatus, R. S. Dixon 439,125
Valve, balanced rotary, D. F. Slayman 439,008
Valve for basins, tanks, or tubs, P. White 439,456
Valve for steam engines, slide, N. T. Greene 439,349
Valves, means for reversing steam, C. E. Brown 4.9,472
Vapor burner, A. Seigle-Goujon 439,367
Vaporizer, C. A. Allen 4.9,317
Vehicle seat, D. F. Oliver 4.9,025
Vehicle, two-wheeled, M. J. Sunderlin 439,262
Vehicle wheel, K. B. Lake 439,408
Velocipede, H. A. Becker 4.9,035
Velocipede, R. J. Fleischer 4.9,206
Vending apparatus, automatic, C. L. Colin, 439,477, 439,478
Vessel closure, A. Michaux 4.9,249
Vessels, side light for, F. E. Torrey 439,312
Viaduct, subaqueous, F. E. Strom 439,010
Violin chin rest, W. Schuster 439,199
Voting machine and toy bank, Kemp & Bixby 4.9,405
Vulcanizing rubber, F. G. Fowler 4.9,137
Wagon, road, J. J. Black 4.9,097
Washing machine, H. P. Baugh 439,206
Washing machine, A. B. Devitt 439,576
Washing machine, J. E. Hartman 4.9,243
Washboard fastener, F. Mink 439,414
Watchmakers' calipers, J. M. Irmen 439,156
Water heater and purifier, steam, J. Bryce 439,574
Water power, device for the development of, M. Nagian 439,165
Water purifier, revolving, E. Devonshire, 439,508 to 439,510
Water tower, M. Burns 439,381
Watering trough, animal, H. W. Clapp 4.9,250
Waterproof garment, M. L. Brown 439,103
Well packers, deep, D. W. Black 439,233
Well packer, deep, B. Masseth 439,166
Wheel. See Car wheel. Metal wheel. Sprocket wheel. Vehicle wheel.
Wheel, C. J. Reynolds 439,188
Wheel, E. A. Seaie 439,259
Whiffletree clip and hook, W. W. Barnes 439,209
Windmill regulator, automatic, F. G. Tallerday 439,611
Window cleaner, Sullivan & Smith 439,331
Wire, shuttle operating mechanism for looms for weaving, W. Hargreaves 439,145
Woodwork, machine for laying off, R. G. Love 439,532
Wrench. See Monkey wrench.
Wrench, K. S. Cushman 439,398
Yarn scouring and dyeing machine, H. J. Campbell 439,473

DESIGNS.

Advertising banner, L. L. Higby 20,241
Roller head, T. L. Rankin 20,238
Building block, E. H. Lewis 20,242
Carriage robe, L. S. Lee 20,243
Dish, G. Vogt 20,250
Drawer pull handle, G. S. Pearson 20,246
Hammer, J. C. Richardson 20,247
Nut lock, ornamental, J. G. Ware 20,2-7
Pipe coupling, J. T. Kelly 20,236
Slate frames, pattern for the ornamentation of, S. Marks 20,245
Statuary, portable niche for, Z. Rizali 20,244
Stove or range, cooking, Bascom & Galbraith 20,240
Table cover, etc., A. Petzoid 20,239
Type, font of printing, Lauschke & Schmohl 20,244
Umbrella ferrule, O. M. Smith 20,249

TRADE MARKS.

Boots and shoes, I. Blyn & Sons 18,550
Boots and shoes, ladies', C. S. Grover 18,565
Cigars, D. L. Trujillo & Sons 18,561
Clothing for men and boys, W. F. Kyle 18,557
Finger rings, J. B. Bowden & Co 18,562
Glue, gelatine, and similar products, Michigan Carbon Works 18,571
Harmonicas, Blumenthal & Bons 18,553
Hominy, American Hominy Flake Company 18,573
Insulated conducting wire, Simplex Electrical Co., 18,551, 18,552
Malt beverages, W. Wirtz 18,566
Medicines, ointments, and lotions, certain proprietary, E. G. C. Rosselle 18,560
Plastic compound for the manufacture of battery jars, insulators, door knobs, billiard counters, cane handles, and similar articles, Fibrome Manufacturing Company 18,569
Printed music and songs and works of fiction, L. J. Libbey 18,566
Rubber shoes, Boston Rubber shoe Company, 18,568, 18,569
Rubber shoes called "Foothalds," Boston Rubber Shoe Company 18,567
Salt, table and other, Genesee Salt Company 18,564
Sheeting and like goods, bleached, Coventry Company 18,570
Underwear for men, women, and children, W. Benger Sons & Co 18,555
Varnishes, japans, fillers, and finishers, C. H. Gillespie & Sons 18,564
Whisky, T. Pease Son & Co 18,572
Wines and liquors, Cafe Savarin Company 18,556
Woods, foreign and domestic cabinet, H. T. Bartlett 18,554

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print, issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Closer foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

USE A DAMANT WALL PLASTER

It is Hard, Dense, and Adhesive. Does not *check or crack.* It is impervious to wind, water, and disease germs. It dries in a few hours. It can be applied in any kind of weather. It is in general use. Licenses granted for the mixing, using, and selling.

Address ADAMANT MFG. CO. 309 E. Genesee St., Syracuse, N. Y.

Patent Foot Power Machinery
Complete Outfits.

Wood or Metal workers without steam power, can successfully compete with the large shops, by using our New LABOR SAVING Machinery, latest and most improved for practical shop use, also for Industrial Schools, Home Training, etc. Catalogue free.
Seneca Falls Mfg. Co.
695 Water Street, Seneca Falls, N. Y.

SEWING MACHINE MOTOR FOR AMATEURS.—By C. D. Parkhurst. Description of a very simple and effective motor, with laminated armature, of sufficient power to actuate a sewing machine. With 11 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 759. Price 10 cents. To be had at this office and from all newsdealers.

SEBASTIAN, MAY & CO'S
Improved Screw Cutting
Foot & Power **LATHES**

Drill Presses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. *Lathes on trial.* Catalogues mailed on application.
165 W. 2d St., Cincinnati, O.

THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the ink by which the copies are made; how to apply the written letter to the pad; how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 438. Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.

The WELLS LIGHT
WALLWORK & WELLS' PATENTS.

2000 CANDLE POWER LIGHT FOR FOUNDRIES, IRON WORKS, BOILER SHOPS, MINES, AND OTHER PLACES REQUIRING A POWERFUL LIGHT
KEEGAN & HALPIN 44-46 WASHINGTON ST. N.Y.

INVENTORS!
New ideas cannot be more effectively presented than through perfect
WORKING MODELS.
Our specialty is fine model work.
N. ERLANDSEN, 107 Rivington St., New York

EDISON LAMPS
For Batteries or Dynamos.

¼ to 36 Candle Power. 3 to 40 Volts.
We will send free, Catalogue E, which gives prices and description of lamps, together with directions
How to Make a Cheap Battery to operate them.
EDISON LAMP CO., HARRISON, N. J.

THE PENNA. DIAMOND DRILL & MFG. CO. BIRDSBORO, PA., Builders of High Class Steam Engines, Diamond Drilling and General Machinery. Flour Mill Rolls Ground and Grooved.

OIL WELL SUPPLY CO. Ltd.
91 & 92 WATER STREET, Pittsburgh, Pa.,
Manufacturers of everything needed for ARTESIAN WELLS for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.

VELOCITY OF ICE BOATS. A COLLECTION of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 214. Price 10 cents. To be had at this office and from all newsdealers.

ARTESIAN
Wells, Oil and Gas Wells, drilled by contract to any depth, from 3C to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue. Pierce Artesian and Oil Well Supply Co., 30 Beaver Street, New York.

MACHINISTS' FINE TOOLS.
STANDARD TOOL CO., ATHOL, MASS.
Send for Catalogue and Price List.

IDEAL MUSICAL BOX
Is the Latest Invention in Swiss Musical Boxes It is the Sweetest and Most Perfect Instrument for the Parlor. Any number of tunes can be obtained for it. The Largest stock of Musical Boxes in America. Send 4 cent stamp for Illustrated Catalogue.
JACOT & SON, 500 BROADWAY, NEW YORK.

PROPOSALS.

Proposals for Harbor Improvements. UNITED STATES ENGINEER OFFICE, No. 366 Milwaukee St., Milwaukee, Oct. 27, 1890.—Sealed proposals, in triplicate, will be received at this office until 12 o'clock, noon, November 25, 1890, and opened immediately thereafter, in the presence of bidders for the following harbor improvements: Menomonee River, Mich. & Wis., dredging about 20,000 cubic yards. Green Bay Harbor, Wis., dredging about 36,000 cubic yards. Kewaunee Harbor, Wis., pier extension, 3.0 feet, more or less. Manitowoc Harbor, Wis., pier superstructure, 600 feet, more or less. Sheboygan Harbor, Wis., pier extension, 150 feet, more or less. Harbor of Refuge, Milwaukee Bay, Wis., breakwater extension and superstructure, 60 feet, more or less. Racine Harbor, Wis., pier extension, 200 feet, more or less. Kenosha Harbor, Wis., pier extension, 150 feet, more or less. The attention of bidders is invited to the Acts of Congress, approved February 26, 1885, and February 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. Proposals will be accompanied by a guarantee that if the bid is accepted, contract will be entered into within ten days after notice of acceptance. Preference will be given to materials and plant of domestic production and manufacture, conditions of quality and price (import duties included) being equal. For blank proposals and information apply at this office. The United States reserves the right to reject any or all bids. Proposals will be indorsed on the envelope, "Proposals for Menomonee River, Mich. and Wis.," or "Proposals for ....., Harbor," and adressed to
MAJOR CHAS. E. L. B. DAVIS, *Corps of Engineers, U. S. Army.*

Proposals for Improving Entrance to Galveston Harbor. U. S. ENGINEER OFFICE, Galveston, Texas, October 25, 1890.—Sealed proposals, in duplicate, will be received at this office, until 12 o'clock, noon, 90th meridian time, December 27, 1890, and then opened, for delivery of materials in place for improving the entrance to Galveston Harbor, Texas. Preference will be given to materials of domestic production or manufacture, conditions of quality and price (import duties included) being equal. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, Vol. 23, page 332, and Vol. 24, page 414. U. S. Statutes at Large. For blank forms for proposals and all necessary information, apply to
CHAS. J. ALLEN, *Major, Corps of Engineers.*

Proposals for Constructing Steam Snagboat. U. S. ENGINEER OFFICE, Savannah, Ga., Oct. 15, 1890.—Sealed proposals, in triplicate, for building a steam snagboat, and for furnishing material and machinery for same, will be received at this office until 12 o'clock M., city time, on the 20th day of November, 1890. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For all necessary information apply to
O. M. CARTER, 1st *Lieut., Corps of Engineers, U. S. A.*

U. S. Engineer Office, 905 1-2 East Main St., Richmond, Va. October 13, 1890.—Proposals for dredging and excavating rock from the channel of the James river, near Richmond, Va., for the construction of mattress dykes and jetties, will be received until noon of December 9, 1890, and then opened. Attention is invited to Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, p. 332, and Vol. 24, p. 414, Statutes at Large. Information can be had on application to Mr. C. P. E. BURGWYN, 905½ E. Main St., Richmond, Va.
WM. P. CRAIGHILL, *Col., Corps of Engineers, U. S. A.*

U. S. Engineer Office, Room 63, Army Building, New York, October 29, 1890.—Sealed proposals, in triplicate, will be received at this office until 12 o'clock noon, Monday, December 1, 1890, for the delivery at Sandy Hook, N. J., of 41,000 cubic yards of broken stone (granite, trap, or limestone) and 62,000 barrels of Rosendale cement. The attention of bidders is invited to Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, vol. 23, p. 332, and vol. 24, p. 414, Statutes at Large. For full information, apply to
G. L. GILLESPIE, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Room 62, Army Building, New York. October 15, 1890.—Sealed proposals, in triplicate, for dredging the channels in Newtown Creek, N. Y., Gowanus Bay, N. Y., and Raritan Bay, N. J., will be received at this office until 12 o'clock, noon, Friday, November 21, 1890. Aggregate amount available, $215,425. The attention of bidders is invited to Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol 24, page 414, Statutes at Large. For specifications, blank forms, and all information, apply to the undersigned,
G. L. GILLESPIE, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Room 62, Army Building, New York. October 15, 1890.—Sealed proposals, in triplicate, for dredging Shell Reef, off Tenth Street, and for blasting and dredging Middle Ground, off Sunken Meadow, East River, N. Y., will be received at this office until 12 o'clock, noon, Wednesday, November 19, 1890. Amount available, $100,000. The attention of bidders is invited to Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For specifications, blank forms, and all information, apply to the undersigned.
G. L. GILLESPIE, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Room 62, Army Building, New York. October 15, 1890.—Sealed proposals, in triplicate, will be received at this office until 12 o'clock noon, Wednesday, November 26, 1890, for removing 500,000 cubic yards, more or less, of material, mud, earth, rock, old timber, etc., from the Harlem River, Spuyten Duyvil Creek, and from the cut through Dyckman's meadow, on the line of the Harlem River Improvement, and for furnishing the materials and workmanship for the construction of revetments for slopes of the sections excavated. Amount available, $240,000. The attention of bidders is invited to Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For specifications, blank forms and all information, apply to the undersigned. G. L. GILLESPIE, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Room 90, 134 Van Buren St., Chicago, Ill. October, 20, 1890.—Sealed proposals in triplicate will be received at this office until 12 o'clock, noon, Wednesday, November 19, 1890, and opened immediately thereafter in the presence of bidders, for the following harbor improvements, viz.: Dredging Calumet River, Illinois and Indiana. Dredging Calumet Harbor, Illinois. Proposals will be accompanied by a guarantee that if the bid be accepted, contract will be entered into within 10 days after notice of acceptance. The United States reserves the right to reject any or all bids. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For specifications, blank proposals, and all other information apply at above address to
CAPT. W. L. MARSHALL, *Corps of Engineers, U. S. A.*

U. S. Engineer Office, Boston, Mass. October 15, 1890.—Sealed proposals, in triplicate, will be received at this office until noon of November 21, 1890, for the delivery of 30,000 tons, more or less, of rubble stone at Newburyport Harbor, Mass. Attention is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. October 15, 1890.—Sealed proposals, in triplicate, will be received at this office until noon of November 21, 1890, for the delivery of 225,000 tons, more or less, of rubble stone, for the Harbor of Refuge, Sandy Bay, Cape Ann, Mass. Attention is invited to the Act of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. October 15, 1890.—Sealed proposals, in triplicate, will be received at this office until noon of November 21, 1890, for dredging from Weymouth River, Mass., 25,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved February 26, 1885, and February 24, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. October 15, 1890.—Sealed proposals, in triplicate, will be received at this office until noon of November 24, 1890, for dredging from the west end of Brewster Spit, Boston Harbor, Mass., 25,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. October 15, 1890.—Sealed proposals, in triplicate, will be received at this office until noon of Nov. 22, 1890, for dredging from the channel leading to Nantasket Beach, Boston Harbor, Mass., 20,000 cubic yards, more or less, of material. Attention is invited to Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 21, 1890, for dredging from Salem Harbor, Mass., 45,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 22, 1890, for dredging from Gloucester Harbor, Mass., 40,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 21, 1890, for dredging from Bingham Harbor, Mass., 20,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 22, 1890, for dredging from Manchester Harbor, Mass., 30,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 22, 1890, for dredging from Scituate Harbor, Mass., 30,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 22, 1890, for dredging from Plymouth Harbor, Mass., 15,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

U. S. Engineer Office, Boston, Mass. Oct. 15, 1890. Sealed proposals, in triplicate, will be received at this office until noon of Nov. 21, 1890, for dredging from Lynn Harbor, Mass., 40,000 cubic yards, more or less, of material. Attention is invited to the Acts of Congress approved Feb. 26, 1885, and Feb. 23, 1887, Vol. 23, page 332, and Vol. 24, page 414, Statutes at Large. For full information apply to
S. M. MANSFIELD, *Lieut. Col. of Engineers.*

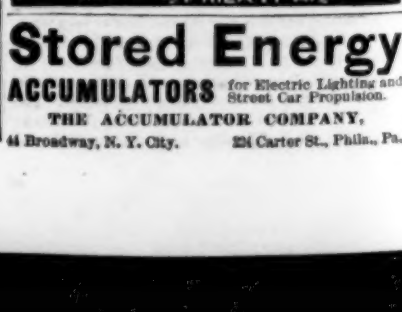
COMPLETE STEAM PUMP
10 SIZES FROM $7 TO $75
FOR WATER SUPPLY TANKS, FIRE PUMPS & ETC.
WRITE FOR PRICES AND DESCRIPTIVE CIRCULARS
VAN DUZEN & TIFT
SOLE MAKERS
CINCINNATI, O.

LABYRINTHS.—DESCRIPTION AND figures of some interesting examples of ancient and modern labyrinths or mazes. Seven illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 767. Price 10 cents. To be had at this office and from all newsdealers.

KEEP COOL!
CLARK'S
Light-Running Ventilating
FANS.
Adapted for Ventilating and Drying of every description.
Catalogue free.
GEO. P. CLARK, Box I, Windsor Locks, Conn.
Jas. Goldsmith, Agent, 746 B'way, New York.

CROSBY
POP SAFETY VALVE
WATER RELIEF VALVE
IMPROVED STEAM GAGE
STEAM ENGINE INDICATOR
Single Bell Chime Whistle, and all instruments used in connection with Steam, Air and Water.
Sole Agents for Clark's Lunen Fire Hose.
NEW YORK. LONDON.
CROSBY STEAM GAGE & VALVE CO. 98 Oliver St. Boston, Mass.

ICE-HOUSE AND REFRIGERATOR. Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept dry and pure throughout the year at a temperature of from 34° to 36°. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 116. Price 10 cents. To be had at this office and of all newsdealers.



Stored Energy
ACCUMULATORS for Electric Lighting and Street Car Propulsion.
THE ACCUMULATOR COMPANY,
44 Broadway, N. Y. City. 224 Carter St., Phila., Pa.

A New and Splendid Companion to all the Metal Industries.

Fully abreast of the latest inventions and discoveries, as well in the largest and coarsest as in the smallest and finest of metal work.

JUST READY.

Price, $2.50.

Free of Postage to any address in the World.

THE

Metal Worker's Handy-Book

—OF—

RECEIPTS AND PROCESSES.

Being a collection of Chemical Formulas and Practical Manipulations for the working of all the Metals and Alloys, including the Decoration and Beautifying of articles manufactured therefrom, as well as their preservation. Edited from various sources by William T. Brannt, editor of "The Techno-Chemical Receipt Book" and "The Metallic Alloys." Illustrated by 63 engravings. One volume, over 500 pages, 12mo, elegantly bound in scarlet cloth, gilt, closely printed, containing a vast amount of valuable matter on all the Metals and Alloys, not to be found in any other book in the English language.

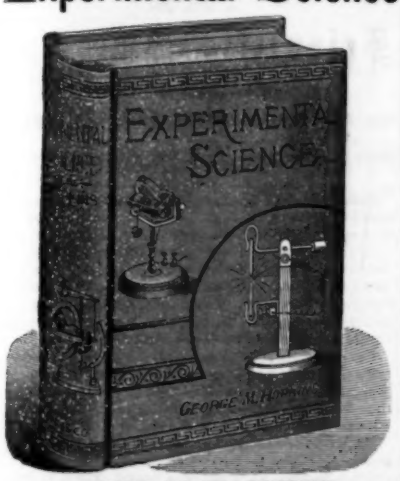
☞ *Price $2.50, free of postage to any address in the world.*

☞ *A circular of 24 pages, showing the full Table of Contents of this valuable book, will be sent free and free of postage to any one in any part of the world who will furnish us with his address.*

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

THE NEW BOOK.

Experimental Science



By GEO. M. HOPKINS.

740 Pages. Over 680 Illustrations.
PRICE, by mail, postpaid, $4.00

SEND FOR FULL ILLUSTRATED CIRCULAR AND TABLE OF CONTENTS.

This is a book full of interest and value for teachers, students, and others who desire to impart or obtain a practical knowledge of physics.

MUNN & CO., Publishers,
Office of The Scientific American
361 BROADWAY, NEW YORK.

What the Press says of "Experimental Science."

"Mr. Hopkins has rendered a valuable service to experimental physics."—*Evening Post.*

"The book is one of very practical character, and no one of a scientific turn of mind could fail to find in its pages a fund of valuable information."—*Electric Age.*

"The electrical chapters of the book are notably good, and the practical instruction given for building simple electrical machinery may be safely carried out by those—not a few—who like to make their own apparatus."—*Electrical World.*

"The author has avoided repeating the backneyed illustrations which have been passed from one book to another so long, and, instead, offers a set of experiments which are largely of a novel character and very striking."—*Engineering and Mining Journal.*

"We commend it most heartily to all teachers."—*Normal Exponent.*

"It is a treat to read a book of this kind, that sets forth the principles of physics so fully, and without the use of mathematics."—*The Locomotive.*

"All teachers of science are aware that real knowledge is acquired best by the student making experiments for himself, and any one who points out how those experiments may be easily made is doing excellent work."—*English Mechanic and World of Science.*

"The work bears the stamp of a writer who writes nothing but with certainty of action and result, and of a teacher who imparts scientific information in an attractive and fascinating manner."—*American Engineer.*

"It should be found in every library."—*English Mechanic.*

"The book would be a most judicious holiday gift."—*Engineering and Mining Journal.*

"The portion of the book devoted to dynamic electricity covers over one hundred pages, and is extremely interesting and valuable."—*Brooklyn Standard Union.*

"Directions are given for demonstrating most of the laws of physics, with every-day tools and common appliances."—*American Photographer.*

"Many of the experiments are new to print, while some of the old, familiar ones appear in modified form and with simplified apparatus."—*Public Opinion.*

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *forty-one years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Patent Building, near 7th Street, Washington, D. C.

FIRE FELT.

THE NEW NON-CONDUCTING MATERIAL is a Flexible Felt Made of Pure Asbestos, in a finely divided fibrous state, indestructible by heat and unexcelled as a Non-Conductor. U. S. Navy tests show it to be superior to Hair Felt in Non-Conducting qualities. Made into sectional form for pipes and into sheets and rolls for large surfaces. Send for Samples.

Asbestos Boiler Coverings, Steam Packings, Asbestos Cloth, Asbestos Building Paper, etc.

THE CHALMERS-SPENCE CO., 59 and 61 Liberty St., New York.
BRANCHES:—Philadelphia, Chicago, Pittsburgh, Boston.

Engravings direct from photographs and other copy. Our circular "N" shows specimens. Fine printing a specialty.

GRAND PRIZE
Paris Exposition, 1889.

Thin Panel Stock
IN WHITEWOOD, WALNUT, ETC.,

Manufactured by the original "Système Bartlett," received the Highest Award and only "Grand Prize" given to this industry. The only "Système" introduced into Europe and America that produces a perfectly sound cut board.

HENRY T. BARTLETT,
CABINET WOODS and VENEERS, | MAHOGANY SAW MILLS,
200 Lewis Street, New York.

Barnes' New Sensitive Drill
Has These Great Advantages:

The speed of the drill spindle can be **Increased** or **Diminished Instantly**, or the motion reversed, without **stopping the machine** or **shifting belts.** More or less driving power can be applied to the drill spindle as the size of the drill or the nature of the work may demand.

W. F. & JNO. BARNES CO.,
1999 Ruby St., Rockford, Ill.

Gates Cornish Rolls Pulverizer

Simple, Durable, Compact, Dustless, and a finished product direct from the machines.
The best Ore Granulator for leaching and concentration.
MANUFACTURE ALSO
Gates Rock and Ore Breakers
Address for Catalogues
GATES IRON WORKS,
50 C So. Clinton St., Chicago.
215 Franklin St., Boston, Mass.
44 Dey St., New York.

A Machine Shop and Laboratory
Where inventors may be helped out of their mechanical troubles. Will send a primer that is itself a help.
THE JONES BROTHERS ELECTRIC CO. CIN'TI, O.

ALUMINUM COMPOSITE. Reduced from $2.00 to 75c. per lb. in ALLOY 100 lbs. (sample) containing 7½ per cent. Aluminum, sent prepaid for only **$7.** We desire to establish an Agency in every large city for our Metal Alloy. For terms and city rights, address **The Schmiedbarenguss Furnace Co., Newport, Ky**

BABCOCK & WILCOX CO.
WATER TUBE
30 CORTLANDT ST. N.Y.
107 HOPE ST. GLASGOW, SCOTLAND.
STEAM BOILERS
MANUFACTORIES IN UNITED STATES SCOTLAND FRANCE GERMANY & AUSTRIA

Awarded the Grand Prize at late Paris Exposition.

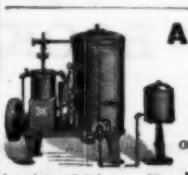
SPECIAL MACHINERY and Appliances executed with perfect workmanship. Entire confidence and interest guaranteed. Draughting, Patternmaking, Planing, Turning, Drilling, etc., etc. WM. GRUNOW, Jr., 204 & 206 East 43d St., New York.

EVERY USER OF MACHINERY SHOULD LEARN
How to Use Loose Pulleys.
Useful information on this subject is given in our "Catalogue No. 56." Sent free to any address.
VAN DUZEN & TIFT, Cincinnati, Ohio.
MENTION THIS PAPER.

REGISTERED TRADE MARK, 13,891.

PATENTED JULY 21, 1885.

The Strongest, Cheapest, and Best Fastening for Leather and Rubber Belting. Beware of poor imitations. *None genuine without this Trade Mark and PICTURE on the package.*
Greene, Tweed & Co.
83 Chambers St., NEW YORK.



Acme Automatic Safety Engine.—"Stationary." Oil Tank.

After being on the Market Five Years
The "ACME" Still Leads!

Sizes One, Two, Three, and Four Horse Power. Arranged for either NATURAL GAS or Kerosene Oil fire, as ordered. No extra insurance required on account of the oil fire. Send for catalogue giving full particulars and prices.

ROCHESTER MACHINE TOOL WORKS, Brown's Race, ROCHESTER, N. Y.

ICE and REFRIGERATING MACHINES

The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

HARRISON CONVEYOR!

For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.
Send for Circulars. | BORDEN, SELLECK & CO., { Sole Manufacturers, } Chicago, Ill.

Fay's Patent Spring Calipers
WITH SPRING NUT.

Price List: 2¾ and 3 in. solid nut, $1 each; 4 and 5 in. spring nut, $1.25 each; 6 in. spring nut, $1.50.
Spring Dividers, Surface Gauges, Bevel Protractors, Screw Pitch Gauges, Steel Rules, and full line of Fine Tools.
☞ Send 2-cent stamp for full list.
L. S. STARRETT, ATHOL, MASS.
Manuf'r of Fine Tools.

THE EAGLE
THE EASIEST RUNNING BICYCLE IN THE WORLD.
Speed, Comfort and Safety.
AGENTS WANTED.
Large Illustrated Catalogue sent Free to any Address.
THE EAGLE BICYCLE MFG. CO.,
STAMFORD, CONN.

TYPEWRITERS.

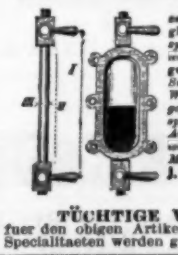
Largest like establishment in the world. First-class Second-hand Instruments at half new prices. Unprejudiced advice given on all makes. Machines sold on monthly payments. Any Instrument manufactured shipped, privilege to examine, EXCHANGING A SPECIALTY. Wholesale prices to dealers. Illustrated Catalogues Free.
TYPEWRITER HEADQUARTERS, { 70 Broadway, New York. 144 La Salle St., Chicago.

IMPERIAL
CLUB of 14 postpaid for $1 bill.
Marks Linen, Cards, Papers, Everything.
New Agents make BIG Money. Terms Free.
Self-Inker $2.50.

Thalman Mfg. Co., No. 184 Balt. St. Baltimore, Md.

WHAT Uncle Sam and Aunt Columbia think, etc., of **WASHINGTON** and SEATTLE. Send stamp to Edelman, Llewellyn & Co., Seattle, W.

Unzerbrechlich. Wasserstandszeiger.



Ersatz für immer der zerbrech. Wasserstandsgläser, daher grosse Ersparnis. Wasserstand von weitem und im Halbdunkel gut erkennbar. Grösste Sicherheit gegen zu tiefen Wasserstand. Schutz gegen Unfälle (Glassplitter, Brandwunden) Anbringung wie ein gewöhnl. Glas. Prima-Refer. Muster für Best.: I II III.
J. G. Ulmann, Zürich.
Maschinen-Fabrik.

TÜCHTIGE VERTRETER
fuer den obigen Artikel, sowie fuer andere Specialitaeten werden gesucht. O. F. 6750.

WINTER PRICES ON BICYCLES

Don't wait till spring; buy now & save money. Easy payments. All makes now & 2d hd. Cat'e free. Rouse Hazard & Co. 160 St. Peoria, Ill.

BARREL MACHINERY.
E. & B. HOLMES BUFFALO, N. Y.
ALSO A FULL LINE OF WOOD WORKING MACHINERY.

$10.00 to $50.00 per night. A light and profitable business. **Magic Lanterns and Views** of popular subjects. Catalogues on application. Part 1 Optical, 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc. **L. MANASSE, 88 Madison Street, Chicago, Ill.**

AGENTS make 100 per cent. profit on my Corsets, Belts, Brushes, Curlers, and novelties. Samples free. Write now. Dr. Bridgman, 875 B'way, N.Y.

$525 Agents' profits per month. Will prove it or pay forfeit. New portraits just out. A $3.50 Sample sent free to all. W. H. Chidester & Son, 29 Bond St., N. Y.

DEAFNESS & HEAD NOISES CURED by Peck's INVISIBLE TUBULAR EAR CUSHIONS. Whispers heard. Comfortable. Successful where all Remedies FAIL. Ills. book & proofs free. Address F. HISCOX, 853 Broadway, New York.

IDE AUTOMATIC ENGINES. TRACTION AND PORTABLE ENGINES.
STEAM ROAD ROLLERS.
WEITMYER PATENT FURNACE. BOILERS OF EVERY DESCRIPTION.
Manufactured by FOUNDRY & MACHINE DEPARTMENT, Harrisburg, Pa., U. S. A.

PERFORATED METALS FOR MINING SCREENS
COAL AND ORE SEPARATORS, REVOLVING AND SHAKING SCREENS
JIGS & STAMP BATTERIES FOR MILLING & MINING MACHINERY
HARRINGTON & KING PERFORATING CO. CHICAGO.
NEW YORK OFFICE, 24 PEARL STREET.

ROPER'S
ENGINEER'S HANDY-BOOK

The most comprehensive and best illustrated book ever published in this country on the Steam-Engine, Stationary, Locomotive, and Marine, and the Steam-Engine Indicator. It contains nearly 300 Main Subjects, 1,316 Paragraphs, 876 Questions and Answers, 52 Suggestions and Instructions, 105 Rules, Formulæ and Examples, 149 Tables, 126 Illustrations, 31 Indicator Diagrams, and 107 Technical Terms, over 5,000 different subjects, with the questions most likely to be asked when under examination, before being commissioned as an engineer in the U. S. Navy or Revenue Service, or licensed as an engineer in the Mercantile Marine Service.

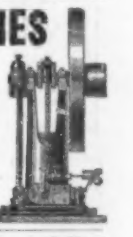
Price $3.50.

For sale by all booksellers or will be sent to any part of the United States or Canada on receipt of list price.

Send money in Registered Letter, P. O. Order, or Postal Note.

EDWARD MEEKS, Publisher,
No. 1012 Walnut Street, Philadelphia, Pa.

OTTO GAS ENGINES



33,000 SOLD.
Engines and Pumps Combined.
For COAL GAS or GASOLINE.
SCHLEICHER, SCHUMM & CO.
PHILADELPHIA, CHICAGO, NEW YORK.

OURS is NOT a cheap and light Regrinding
GLOBE VALVE
None superior for Steam. Adopted on Locomotives and Steamboats.
Write for complete catalogue.
The Lunkenheimer Brass Mfg. Co.
15-17 E. 8th St., Cincinnati, O.

All Ages Enjoy this Parlor Game.

Intensely Amusing and Perfectly Harmless.
The *only arrow* made *without a point* that will stick to glass or any smooth surface. Will not mar furniture or hurt any one.
Pat. in France, England, Germany, U. S. and Canada.
Post-paid, Nickel, $1. Bronze, 75c.
RUBBER TIPPED ARROW CO.,
Patentees and Manufacturers. Boston, Mass., U. S. A.

TRANSMISSION OF POWER BY COMPRESSED AIR.—A valuable and interesting review of the present status of the problem of establishing compressed air plants for furnishing motive power to consumers. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 765. Price 10 cents. To be had at this office and from all newsdealers.

THE MOST USEFUL household invention now on exhibition at the American Institute Fair is **Sudlow's Improved Ash Sifter.** It is dustless and can be placed in any part of the house. It is automatic and there is no crank to turn and no shaking required. It will pay for itself in a short time. S. SUDLOW & SON, 295 Ewen Street, Brooklyn, E. D., New York. Patent for sale to States.

EXCELLENT BLACK COPIES, only equaled by Lithography, of *anything written or drawn* with *any* Pen by the Patent Specimens free. **AUTOCOPYIST**
Ten Eyck & Parker, 66 Pine Street, New York

VOLNEY W. MASON & CO.,
FRICTION PULLEYS CLUTCHES and ELEVATORS
PROVIDENCE, R. I.

FOR SALE.—Folding Chair patent No. 424,952, dated April 8, 1890. The best invention of its kind. For particulars address AUGUST BLUM, 115 West Bay St., Jacksonville, Fla.

WE WANT one Agent in every manufacturing town and city in the United States to introduce our Anti-Incrustation Powder for Steam Boilers. It removes the hardest scale known, and positively will not injure the Steam or Iron. Also our **Belt Dressing** It keeps the belts soft and pliable, and positively prevents slipping. Satisfaction guaranteed on our goods or no pay asked. To the right man a good permanent paying position is offered. Send 50 cents for samples, etc. J. F. STEPHENSON & BROS., 2d Avenue and Beekman St., Albany, N. Y.

Patente.

An deutsche Erfinder.

Die grosse und thätige Klasse der deutschen Erfinder in den Vereinigten Staaten machen wir besonders darauf aufmerksam, dass unsere Firma durch ihre Verbindungen mit Washington und den europäischen Hauptstädten, besondere Vortheile zur Erlangung von in- und ausländischen Patenten bietet.

Jeder Erfinder, gleichviel welcher Nationalität angehörig, ist durch die liberalen Patentgesetze der Vereinigten Staaten zum Patentschutz für Erfindungen berechtigt.

Unsere Firma ist bereit, gestützt auf eine 45 jährige Erfahrung, deutsche Erfinder jeder Zeit zu berathen und ihnen behülflich zu sein zu mässigen Preisen rasch und pünktlich Patente zu erlangen.

Unsere deutsche Abtheilung wird von fähigen deutschen Ingenieuren geleitet welche in der Office mit persönlich vorsprechenden Erfindern direkt verkehren, und Rath und Auskunft geben. — Unsere weitbekannte und populär gehaltene Zeitschrift der "Scientific American" bespricht in ihren Spalten die bedeutenderen Erfindungen der Neuzeit. Eine kurze Beschreibung von Erfindungen, die durch uns patentirt werden, geben wir unentgeltlich in unserer Zeitschrift.

Correspondenz in deutscher Sprache erbeten.

Pamphlet, in deutscher Sprache, über Patente wird auf Verlangen frei zugeschickt.

Man adressire:

MUNN & CO.,
361 Broadway, New York.

Advertisements.

Inside Page, each insertion - - - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line.

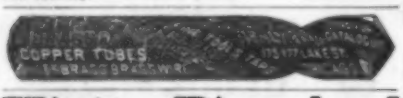
The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Something New in Belting

More flexible and nine times stronger than leather. Is not affected by wet, dry, or heat. Send your name and address for description and price list to THE MIDGLEY WIRE BELT CO. of BEAVER FALLS, PENNA., U. S. A. Responsible agents wanted to sell this new invention covered by more than twenty patents.

Levels, Transits, Surveyors' Compasses, Pocket and Prismatic Compasses, Hand Levels, Angle Mirrors, Planimeters, Pantographs, Engineers' Slide Rules, Leveling Rods, Poles, Chains, etc.
Catalogue on application.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.



Victor Bicycles!

For pleasure, business, recreation, and for anything you could use a bicycle for.
VICTORS ARE BEST!
Send for catalogue.
Overman Wheel Co., Makers,
Chicopee Falls, Mass.

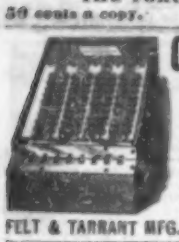
THE FORUM.

The Foremost Review of Living Subjects by the Leading Writers of the World.

THE FORUM covers the whole range of subjects of present concern to thoughtful readers. Among the articles of a scientific nature that will appear in early numbers, are

Speed and Safety in Railway Travel, by Prof. R. H. Thurston, of Cornell University.
The Development of War Ships, by Commander P. A. Barber, U. S. N.
The Flood-Line of Rivers, by Prof. W. J. McGee, of the U. S. Geological Survey.
Dirigible Balloons, by Gaston Tissandier, the greatest authority on this subject in the world.
Color Photography, by Capt. W. de W. Abney, of the British Army.
Results of the Census, by Gen. Francis A. Walker
Lightning, by Oliver J. Lodge, of England.
The Development of Firearms, Dr. R. J. Gatling

THE FORUM, NEW YORK.
50 cents a copy. $5.00 a year.



COMPTOMETER

(TRADE MARK.)

ALL ARITHMETICAL PROBLEMS

Solved rapidly and accurately by using the COMPTOMETER. Saves 40 per cent. of time. Entire relief from mental strain. Adapted to all commercial and scientific computations. Send for circular.

FELT & TARRANT MFG. CO., 52-56 Illinois St., Chicago.

1 to 40 H. P.

The Motor of 19th Century

Can be used *Any Place*, to do *Any Work*, and by *Any One*. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. Cost *of operation about one cent an hour to each indicated horse power.* For circulars, etc., address

Economy, Reliability, Simplicity, Safety. Charter Gas Engine Co. P. O. Box 145. Sterling, Ill.

NEW KODAKS

"You press the button, we do the rest."

Seven New Styles and Sizes

ALL LOADED WITH

Transparent Films.

For sale by all Photo. Stock Dealers.

THE EASTMAN COMPANY,

Send for Catalogue. ROCHESTER, N. Y.

THE AMERICAN BELL TELEPHONE CO.

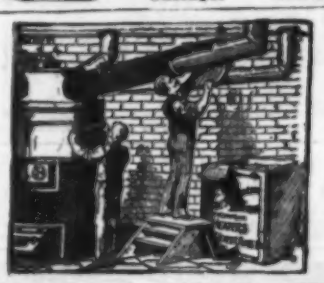
95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

THE GUTTA PERCHA & RUBBER MFG. CO.

The Largest Manufacturers of Mechanical Rubber Goods in the World.
Established 1855.
Packing, Belting, Hose, Mats, Matting, etc.
Para Building, 35 Warren St., New York.
Chicago. San Francisco Portland, Oregon. Boston, Mass.



H. W. JOHNS' ASBESTOS

FIRE-PROOF, NON-CONDUCTING
COVERINGS.
FOR FURNACES, HOT-AIR PIPES, ETC.
85 PER CENT. OF FUEL SAVED.
DESCRIPTIVE PRICE LIST, FREE BY MAIL.
H. W. JOHNS MANUFACTURING CO.,
SOLE MANUFACTURERS.
ASBESTOS ROOFING, BUILDING FELT, ETC.
SECTIONAL PIPE & BOILER COVERINGS, STEAM PACKINGS, ETC.
LIQUID PAINTS, FIRE-PROOF PAINTS, COATINGS, ETC.
87 MAIDEN LANE, NEW YORK.
CHICAGO. PHILADELPHIA, LONDON.

JENKINS STANDARD PACKING!

JENKINS BROS., 71 John St., N. Y.; 105 Milk St., Boston; 21 North 5th St., Phila.; 54 Dearborn St., Chicago

"Improvement the order of the age."

THE SMITH PREMIER TYPEWRITER

Important Improvements.
All the Essential Features greatly perfected
The Most Durable in Alignment.
Easiest Running and Most Silent.
All type cleaned in 10 seconds without soiling the hands.
The Smith Premier Typewriter Co., Syracuse, N. Y., U. S. A.
Send for Catalogue.

PRACTICAL BUSINESS TYPEWRITERS AT A LOW PRICE

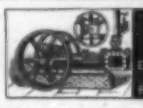
Catalogue free. Address Typewriter Department, POPE MFG. CO., Boston, New York, Chicago.

ROUTING and RULING MACHINES.

For ZINC, TYPE METAL, WOOD, &c., &c.
STEAM AND FOOT POWER.
SEND FOR CIRCULARS.
J. J. WATROUS, MANF'R.
213 RACE STREET,
Cincinnati, - - - Ohio.

WORKING MODELS

and Experimental Machinery, metal or wood, made to order by MASON & RAUCH, successors to J. F. Werner, 47 & 49 Centre Street, New York.



PORTER AUTOMATIC ENGINE (CENTER CRANK)

ECONOMY PERFECT REGULATION OF SPEED
ABSENCE OF ALL PARTS
REQUIRING FREQUENT ATTENTION

PORTER MFG. CO. LIMITED.
SYRACUSE N.Y.
BUILDERS OF AUTOMATIC AND PLAIN SLIDE VALVE ENGINE
ALSO
CONSTRUCTORS OF TANKS, STAND PIPES, BOILERS AND STONE CRUSHERS
SPECIFICATIONS SOLICITED ESTIMATES GIVEN

54TH EDITION.—113TH THOUSAND.

ENGINEERS' POCKET-BOOK

By CHARLES H. HASWELL.

Mechanics' and Engineers' Pocket-Book of Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics: including Areas, Squares, Cubes, and Roots, etc.; Logarithms, Hydraulics, Hydrodynamics, Steam and the Steam-Engine, Naval Architecture, Masonry, Steam-Vessels, Mills, etc.; Limes, Mortars, Cements, etc.; Orthography of Technical Words and Terms, etc., etc. 12mo, Pocket-Book Form, pp. 930, $4.00.

"I cannot find words to express my admiration of the skill and industry displayed in producing the same. To you belongs the honor of having presented to the world a book containing more *positive* information than was ever before published. I could with justice say more."—*Extract from a Letter to the Author from the late* Capt. J. ERICSSON, *the celebrated Engineer.*

BY THE SAME AUTHOR.

MENSURATION AND PRACTICAL GEOMETRY. Containing Tables of Weights and Measures; Vulgar and Decimal Fractions; Mensuration of Areas, Lines, Surfaces, and Solids; Lengths of Circular Arcs; Areas of Segments and Zones of a Circle; Board and Timber Measure, Centres of Gravity, etc., etc. With a Treatise on the Carpenter's Slide-Rule and Gauging. 12mo, Sheep, pp. 324, 90 cents.

Published by HARPER & BROTHERS, New York.

The above works are for sale by all booksellers, or will be sent by HARPER & BROTHERS, *postage prepaid, to any part of the United States, Canada, or Mexico, on receipt of price.* HARPER'S NEW CATALOGUE, *a descriptive list of over 300 volumes, sent, postpaid, on receipt of Ten Cents.*

CUTLER DESK. BEST IN THE WORLD.

A CUTLER & SON, BUFFALO, N. Y. U. S. A.

JAMES LEFFEL WATER WHEELS

ENGINES, and BOILERS.
JAMES LEFFEL & CO.
FARLO ST., SPRINGFIELD, OHIO.
110a Liberty Street, New York City.

AMATEUR PHOTOGRAPHERS

or those wishing to try photography, send name on postal for useful information before purchasing photo materials. We guarantee to save you money. THE JOHN WILKINSON CO., 209 & 211 State St., Chicago.

ESTABLISHED HALF A CENTURY.

MARVIN'S FIRE & BURGLAR SAFES

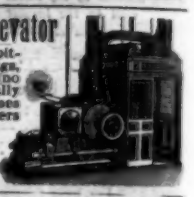
HAVE MANY PATENTED IMPROVEMENTS NOT FOUND IN OTHER MAKES
THAT WILL WELL REPAY AN
INVESTIGATION
BY THOSE WHO DESIRE TO SECURE
THE BEST SAFE
MARVIN SAFE CO.
NEW YORK, PHILADELPHIA, LONDON, ENGLAND.

NATIONAL FILTER

PRICE $95.00.
BRIGHT SPARKLING WATER GUARANTEED
NATIONAL WATER PURIFYING CO.,
Address for Pamphlet, 145 Broadway or 86 Liberty St., New York.

SYRACUSE MALLEABLE IRON WORKS

The OTIS Electric Elevator



for Private Residences, Hospitals, Small Office Buildings, Stores, etc. It is safe, simple (no Engineer required), practically noiseless. Running expenses very light. Also manufacturers of the Standard Hydraulic Passenger and Freight, Steam and Belt Elevators.
Otis Brothers & Co.,
38 Park Row, New York

GRAVES ELEVATORS.

PASSENGER & FREIGHT

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 539. Price 10 cents. To be had at this office and of all newsdealers.

ARMSTRONG MAN'F'G. CO.

Our ADJUSTABLE STOCKS and DIES are universally acknowledged to be the
BEST!
We also make all our Tools on the same principle of the BEST MATERIAL and WORKMANSHIP, and always with a view of time and labor saving in their use.
BRIDGEPORT, CONN.

THE

Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States, Canada or Mexico, on receipt of three dollars by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE

Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check

MUNN & Co., 361 Broadway, N. Y.
Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest plans for private residences, city and country, including those of very moderate cost as well as more expensive. Drawings in perspective and floor plans are given, together with full Plans, Specifications, Details, Estimates, etc.

The elegance and excellence of this magnificent work have won for it the largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.